Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROB'T MCKEAN, Sec'y.
505 Pearl St., New York.
6 Bouverie St., London, E. C.
Unter den Linden 71, Berlin.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

During 1910 *we printed and circulated* 526,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for August, 1911, *averaged* 9750 *copies per issue.*

September 2	10,500
September 9	9,500
September 16	9,500
September 23	9,500
September 30	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 92. SEPTEMBER 30, 1911. No. 14.

Dredge Building in California

The article on dredge building published in this issue of the JOURNAL, immediately following a descriptive article in last week's issue, on hydraulic mining, gives opportunity for comments on these two most widely applicable methods of working gold-bearing gravel.

As compared with hydraulicking, dredging is a comparatively new factor in the production of gold, but once developed to a high degree of efficiency it rapidly attained an importance that makes the quota of gold produced by hydraulic mining comparatively insignificant.

Dredging has these advantages over hydraulicking: Deposits of gravel may be worked for which there is no water available in sufficient quantity or under sufficient head to operate a monitor; where there is no grade on bed rock to facilitate removal of the washed-down gravel, and where there is no place suitable for the disposal of the débris from hydraulic mining. After the first attempts to dredge auriferous gravels were brought to a successful conclusion in New Zealand, deposits of great area in California and Alaska, as well as some of smaller area in the States of Montana, Colorado, Idaho, Oregon and Nevada became of value. There are other great deposits in the Yukon, British Columbia and other parts of Canada, as well as many fields in the western States, but except in Alaska, the field for dredging in the United States is as nothing compared to the great deposits in South America, Siberia and other parts of Asia.

Perhaps at the present day, the gravels of Colombia are the most important of the foreign deposits that will be developed within the next decade. The area of these is enormous and will no doubt support an industry as extensive as those of Alaska and California. There are rich gravel deposits in the Guianas and in many parts of the forest-covered area of eastern South America which resemble the central and western Africa country, but although these gravels as a rule contain more gold than the deposits of California and Colombia their development will be slower on account of the difficulties of transportation and because of being covered by a dense forest.

It has already been under consideration to ship some of the smaller California dredges to Colombia, and as these fields and those of other South American countries are developed there will be a demand for dredges which, after the Panama canal is cut, California will be in a good position to fill.

Trust Busting

It seems to us that the trust-busting operations of the Government and the hysterics of interested capitalists have both been overdone. Wall Street seems to forget that although the oil and tobacco companies have been ordered dissolved, a Federal grand jury has given the smelting company a clean bill of health. All consolidated industrial companies are not in contravention of the Sherman law. This seems to have been forgotten by the Department of Justice, which has unduly stirred up things by what appear to be promiscuous prosecutions. That ought to be checked.

It has been amply proved that legitimate consolidations of industrial companies are of great economic benefit. Wealth is saved and distributed in dividends which otherwise would be wasted, to the advantage of nobody. This step in commercial progress must and ought to be retained.

If, however, big companies are organized to increase profits by practices that may be roughly generalized as cheating, the popular opinion of the day rightly holds that they should be condemned and dissolved.

This seems to be a reasonably simple distinction, but there are naturally many operations as to the fairness or unfairness of which opinions may differ. The trouble of the day is that there are no specific rulings of the courts and the position of many companies is shrouded in uncertainty.

This being the case, it seems reasonable that the Department of Justice, before bringing suits for dissolution against companies organized with no illegitimate intentions, should point out to them in what way they are infringing the law and give them an opportunity to adjust themselves to it.

It is said ordinarily that ignorance of the law is no excuse for breaking it, but in this case nobody has known until recently, not even the Government, what the law is, and ideas about it are still hazy. This should be recognized by the Administration.

Electrolytic Refining Processes

The copper refineries seem to present a peculiar state of affairs, in that three distinct processes of refining are at present in use, the multiple, the cast-series, and the rolled-series. In the multiple system the anodes and cathodes are arranged alternating in the tanks, and the current travels through a number of them in parallel. In both series systems, all of the plates in a given tank are in series electrically, and there is but one true anode and one true cathode in each tank, the remainder of the plates being cathode on one side and anode on the other.

That no system has displaced the other two merely shows that no one seems to present any overwhelming advantages. The rolled-series system results in the largest deposit per kilowatt-hour, less scrap is returned from the tank room, there is less silver and gold tied up, and the plant is more compact, but against this there is the expensive anode rolling, a large amount of anode-mill scrap returned to the anode furnaces, and operations must be conducted with greater nicety than in the other processes. The cast-series system dispenses with the elaborate anode mill, but sends back more tank-room scrap, requires rather more tank-room labor, and does not get so high a deposit per kilowatt-hour. The multiple system has the lowest deposit per kilowatt-hour, but handles the material more by machinery, requires less intelligent labor, and is more universally applicable to all grades of copper.

From the adoption of the multiple system in the last four or five refineries built it seems evident that the general trend of opinion favors this arrangement. Whether the users of the highly specialized series systems would choose them if they were now putting up their plants is open to question; certainly as long as a large supply of comparatively pure, low silver-bearing copper is available neither can afford to scrap the present plant. Whether either could swallow a straight diet of impure highly argentiferous copper, as does a multiple refinery, is open to doubt.

The various advantages and disadvantages of the systems show the considerations which must be weighed before an electrolytic process can be put into practice. These questions have been weighed and answered by two lead electrolytic refiners, who decided in favor of the multiple.

Steel Stocks and the Law

It did not appear probable on the face of things that the United States Steel Corporation would voluntarily undertake to dissolve its organization, and to separate its vast properties into their original elements. The task would be so great and complicated, and the interests involved so large, that it is difficult to believe that anyone would favor its voluntary assumption. Nor did it seem probable that the law officers of the Government would begin proceedings to compel such a dissolution unless there should be in evidence a much plainer violation of the law than is now apparent to the public. So far as has yet appeared the management of the Steel Corporation has taken the greatest care to keep within at least the letter of the law. Until quite recently no one had seriously considered that it was liable to attack.

Yet the belief that one of these two things was contemplated was strong enough to cut down the price of Steel stock 15 or 20 points and to upset Wall Street as it has not been upset for four years. It is true that the general speculative tendency has been bearish, or pessimistic, for some months, and this made the present break in Steel easier; it is also true that the persistent silence of the heads of the Steel Corporation, and the reported talk of the head of the Law Department gave some color to the reports. At last, after the close of business on Sept. 26, and when the break in stocks had gone far, an official statement was put out by the Steel Corporation contradicting the prevailing rumors.

It is rather unfortunate that the condition of the foreign financial markets has been such as to help rather than hinder bearish conditions here. The action of nearly all the great European banks in advancing their discount rates last week —the Bank of France making the first change in nearly four years—at a time when there was no real scarcity of money, had a most unfavorable effect. But there are political conditions in Europe and a threatening unrest of labor which do not directly affect this country.

The Situation in Mexico

At present Mexico is in a state of unrest, which is checking mining and all other branches of industry. It is hoped that after the election, Oct. 1, there will be a settlement of disturbances and a resumption of business. The reports that now come from Mexico to our border towns indicate an expectation that the election will pass off peaceably and there is a feeling of optimism as to the future. All Mexicans who are really patriotic will dismiss selfish interests and unite to restore order in their country. We hear of mining negotiations that are delayed pending the election and doubtless much business is awaiting its result. Although the election is to take place on Oct. 1, and the vote of the cities may be known within two or three days thereafter, it is probable that the returns from remote districts will not be received for a fortnight or so, and possibly the reporting of the result for the whole country may be correspondingly delayed. This is to be taken into consideration in interpreting early reports.

With the turbulent sea of trust busting at the hight of its fury, the copper-merger rumor intrepidly thrusts its head above the troubled waters, appearing this time at Duluth, via London, where "owing to the attitude of the United States Government toward so called trusts, it was deemed wiser to form the consolidation, with Baron Rothschild at its head." Of course, anything may happen, and perhaps when the country becomes more friendly toward "benevolent combinations," the copper merger may be accomplished, but ——. Someone once declared, in effect, that that talkative maiden, Rumor, though figured as a youthful winged beauty, is in fact a very old maid, who chatters in the ear of a fellow gossip.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Antidote for Cyanide Poisoning

In a recent issue of the JOURNAL, I noticed some correspondence regarding antidotes in cases of cyanide poisoning. As it an absolute necessity that everyone interested in cyaniding workings should be acquainted with all fresh knowledge gained on the subject, I would like to call attention to my paper[1] on the use of adrenalin as an emergency treatment in cyanide, strychnine and other forms of noncorrosive poisoning.

The usually accepted and best known chemical antidote for cyanide taken by the mouth is an alkaline solution of ferrous sulphate (which combines with the cyanide and forms the innocuous prussian blue), which is conveniently kept in the form recommended by Prof. W. Martin and Dr. J. E. O'Brien. As Martin and O'Brien showed, if the antidote is not administered within five minutes of a fatal dose of poison, there is no hope for the patient. Even when this antidote is kept in its most convenient form, it takes at least two or three minutes to prepare it for administration, so that if two or three minutes had been lost before the patient had discovered that he had taken cyanide, his chances of survival would be extremely poor.

From theoretical considerations I was led to investigate whether the administration of adrenalin would delay the absorption of the poison into the system and so give time for the application of the usual measures and antidotes. The results of my experiments have shown that if the adrenalin solution (which can be kept ready on a shelf and needs no further preparation, although it deteriorates on standing) can be administrated within five minutes of the poisoning, there is gained a respite of a further four minutes or so for the administration of the antidote. Moreover, my experiments showed that if adrenalin were given within five minutes of the poison, the animal would recover if its stomach were completely emptied by a thorough stomach wash, even though no chemical antidote had been given.

The recommendations which I laid down were:

(1) Adrenalin to be immediately given—12 cc. of the 1:1000 solution diluted, or better, 120 cc. of the 1:10,000 solution.

(2) Use Martin's antidote, 30 cc. of a 23 per cent. ferrous-sulphate solution; 30 cc. of a 6 per cent. caustic-potash solution; 2 grams of powdered magnesium oxide (light). The ferrous-sulphate solution should be freshly prepared or kept in a hermetically sealed bottle.

(3) The stomach to be thoroughly washed out.

(4) A further small dose of adrenalin to be given to follow up any cyanide which the antidote or wash has failed to reach. About one-half the dose recommended in direction (1).

(5) A good saline purge to be administered and the patient put to bed under the care of a medical man, if possible. If Martin's antidote is not at hand, then 1, 3, 4 and 5, as above. The adrenalin administered thus as an antidote will not deleteriously affect the individual. I hope these notes may be of some value to cyanide workers.

J. L. JONA.

University of Melbourne, Australia, Aug. 24, 1911.

[1] *Intercolonial Medical Journal of Australasia*, July 20, 1909.

Vanadium Steel in the United States

In the JOURNAL of Aug. 26, p. 400, the production of alloy steels in the United States for the year 1910 was given, according to the report of the American Iron and Steel Association. The total for vanadium steel is stated as 9049 tons, which, I am confident, is incorrect, as I have written to the principal manufacturers of vanadium steel, and have their replies, showing that the aggregate production of vanadium steel in the United States for 1910 was approximately 40,000 tons.

I have exact statements from 21 manufacturers; several refused to disclose their figures. This total of 40,000 tons includes only vanadium steel and not the large amount of vanadium used in the manufacture of iron castings and a smaller quantity used in brass, bronze, white metal, and bearing metals.

In *Engineering* for May, 1911, a contributor estimates that the annual consumption of metallic vanadium in the United States is 250,000 lb. and that it is used at the rate of 5 lb. per ton of steel. On this basis the production of finished vanadium steel would have been 50,000 tons, which is certainly a closer statement of facts than the 9049 tons as given in the article that was published in the JOURNAL. It must also be taken into consideration that the alloy steel that showed the highest total in that article represented nothing but rails, while the total given herein for vanadium steel represents a much higher class of product and includes automobile and locomotive forgings, gears, locomotive axles, piston rods, tool steel and other manufactured parts for high-duty service.

GEORGE E. LEES.

Pittsburg, Penn., Sept. 14, 1911.

Jacket Water for Blast Furnaces

From the article on jacket-water requirements, by P. E. Barbour in the JOURNAL of Sept. 9, there are some rather interesting deductions to be drawn. According to this article, two furnaces required 565 gal. of water per min., and raised its temperature 35.5 deg. F. This is approximately equal to 6,773,729 lb. of water per day, and to a heat absorption of 240,467,380 B.t.u. The coke was 83.04 tons. If coke be taken at 13,000 B.t.u. we have a total B.t.u. in the coke of 83.04 × 26,000,000 or 2,159,040,000 B.t.u.; i.e., the jacket water was absorbing 11.1 per cent. of the total calorific value of the fuel. It also appears that could furnaces have been used, which vaporized the water, instead of circulating it, it would have been necessary to pump only about 18.2 gal. per minute.

BLAST FURNACE.

Clifton, Ariz., Sept. 18, 1911.

The Floessel Track Spike

In the JOURNAL of Sept. 15 there is a description of a new track spike invented in Sydney, Australia, which, however, is not novel. In 1888, while laying a curve into a mine I owned in California, it became necessary to use some old spikes, one of which had a half-turn twist in it. I found that in order to get the lip of the spike to lap the rail in the ordinary manner it was necessary to turn it half way round at the start, then driving by maul brought it into its proper position, wedging the rail firmly. We afterward purposely twisted the spikes for use on curves in many mines in the United States and Mexico; I applied for patent but found that I had been anticipated by some years. Later, I had some of these spikes tried on 80-lb. rails under trying conditions on the main line of a trunk railroad; they were a great success and it was unnecessary to go to the expense of boring holes, but as no patent could be obtained I let the matter drop.

R. W. PETRE.

Baltimore, Md., Sept. 17, 1911.

California Metal Production in 1910

The mine output of gold, silver, copper and lead in California in 1910 had a value of $27,020,405, according to figures compiled by Charles G. Yale and just made public by the U. S. Geological Survey. The production of gold was $19,715,440; of silver 1,840,085 oz.; of copper 48,700,756 lb., and of lead 2,870,977 lb. These figures show a decrease in the output of gold, silver, and copper as compared with the figures for 1909, but a large increase in lead. The 1909 figures are as follows: Gold, $20,237,870; silver 2,098,253 oz.; copper, 57,288,281 lb.; lead, 1,502,597 pounds.

There were 1079 mines producing gold, silver, copper or lead in California in 1910, of which 564 were gold placer mines. Of the deep mines 485 were gold mines, nine were silver mines, 10 were silver-lead mines, and 11 were copper mines. Of the placer producers 168 were hydraulic mines, 72 were dredges operated by 41 companies, 139 were drift mines in ancient river gravels, and 185 were sluicing mines. Measured by the number of producers as well as by tonnage and metal output, deep mining decreased somewhat in California in 1910. Among the placers sluicing decreased also, but dredge and drift mining increased.

In 1910 there were 2,697,885 tons of ore from deep mines sold or treated in California, with an average total recoverable value of $6.71 per ton. Of the total recovered value in ores in 1910 milling ores yielded $10,005,190 in gold and silver; and smelting ores, $1,669,008 in gold and silver, $6,184,996 in copper, and $126,323 in lead. Placers produced $8,888,795 in gold, of which $635,498 was from hydraulic mines, $516,929 from drift mines, $7,550,254 from dredges, and $186,114 from sluicing mines, the yield from dredges alone being over 38 per cent. of the total gold output from all sources in California in 1910.

Gold dredging has been of constantly increasing importance in California since 1899, when the yield from this source was $206,302. In 1910 it was $7,550,254. The total gold output by dredges in California to the end of 1910 was $40,318,775. The three great dredging fields are those of Yuba, Sacramento and Butte counties, of which the Yuba county field showed an increased output of $730,557 in 1910, while the production from Butte county decreased $501,038 and that of Sacramento county decreased $164,542.

The accompanying table gives the mine production of California by counties in 1910. Of the total gold placers furnished $2,468,505 from Butte county, of which $2,389,235 was from dredges; $1,394,537 from Sacramento county, of which $1,369,594 was from dredges; and $3,199,952 from Yuba county, of which $3,172,476 was from dredges. Dredges also produced $191,900 in Calaveras county, $213,980 in Merced and Stanislaus counties combined, and $109,182 in Siskiyou country.

Hydraulic placers produced $179,105 in gold from Siskiyou county and $328,154 from Trinity county. Drift mines produced $147,599 in placer gold in Nevada county and $151,743 in Placer county. Surface or sluice placers produced $29,700 in Plumas county, $22,339 in Siskiyou county, and $27,476 in Yuba county, and smaller amounts of gold in most of the other producing counties of the State.

The largest increases in gold production by counties in California were $347,461 in Amador, $80,815 in Mono, $122,363 in Sierra, and $734,408 in Yuba. The largest decreases were $499,288 in Butte, $292,806 in Calaveras, $78,885 in Mariposa, $126,752 in Nevada, $272,940 in Sacramento, and $310,077 in Tuolumne. The Mother Lode in Amador, Calaveras, Eldorado, Mariposa and Tuolumne counties produced 1,170,497 tons of ore in 1910, with a total recovery in gold and silver of $4,435,802, or an average of $3.78 per ton, against 1,338,160 tons yielding $4,854,355, an average of $3.60 per ton, in 1909.

METAL PRODUCTION OF CALIFORNIA IN 1910

County	Ore Treated, Tons	Gold, Value	Silver, Oz.	Copper, Lb.	Lead, Lb.
Amador	577,934	$2,646,246	36,883	151,480	.....
Butte	13,578	2,487,791	11,851	.....	659
Calaveras	436,263	1,147,705	155,248	7,302,331	.....
Colusa and Lassen	12,102	82,180	1,800	.....	.....
Del Norte	.....	2,388	22	.....	.....
El Dorado	17,383	171,304	1,791	.....	.....
Fresno	14,482	3,373	5,717	486,724	.....
Humboldt	10	35,289	278	.....	.....
Imperial and San Diego	44,835	87,341	439	.....	.....
Inyo	52,963	408,509	239,982	58,047	2,866,894
Kern	197,550	619,974	64,891	.....	569
Madera	2,369	10,076	3,426	298,898	.....
Mariposa	42,703	317,580	4,377	.....	.....
Merced and Stanislaus	.....	214,187	1,119	.....	.....
Modoc	774	5,438	139	.....	.....
Mono	24,913	435,724	17,391	.....	.....
Monterey, San Luis Obispo and Santa Cruz	410	1,013	25	.....	.....
Nevada	250,358	2,533,483	30,566	.....	.....
Placer	15,688	257,191	2,143	.....	.....
Plumas	41,681	187,207	1,923	.....	1,114
Riverside	557	5,585	52	.....	.....
Sacramento	150	1,396,874	8,530	.....	.....
San Bernardino	7,102	55,093	18,822	5,992	1,545
Shasta	696,333	1,533,728	1,201,676	40,397,284	196
Sierra	28,461	312,035	2,463	.....	.....
Siskiyou	13,331	437,376	4,299	.....	.....
Trinity	7,925	500,851	3,629	.....	.....
Tuolumne	197,737	615,626	10,655	.....	.....
Yuba	293	3,204,273	9,948	.....	.....
Total	2,697,885	$19,715,440	1,840,085	48,700,756	2,870,977

Chilean Gold Discovery

A discovery of rich gold ore has been made in Chile at Putu, near Constitucion, according to a cablegram received, Sept. 25, from Mark R. Lamb. Constitucion is a coast town about 200 miles south of Santiago.

An unusually large production of gold is reported from float during the first fortnight and the discoverer has been granted 50 days in which he has exclusive locating rights within a three-mile radius.

End of the Lakeview Gusher

After a continuous spectacular performance of 18 months, lacking five days, the great Lakeview gusher in California, probably the greatest in history, gave a few spasmodic quivers, spouted a stream of oil over the tops of the derricks of its nearest neighbors, the Sage No. 9 and the Maricopa 26, and died without further sound or motion, says the San Francisco *Chronicle*. It is believed by the superintendent that a cave-in occurred in the depths of the well and that probably the gusher has gone without recall. The oil stands full to the top of the reservoir and fills the great basin to the level of the drain pipe. It is supposed that the casing has long ago been worn out by the sand grinding it away and thrown out of the hole bit by bit by the force of the escaping gas. Last week the gusher was making about 800 bbl. of oil per day, the one-hundredth part of its initial production. Some water was mixed with the oil, but it was separated easily. About seven months ago the product turned to an inseparable mixture of water, oil and disintegrated shale and clay, called "mulsh" by the oil men. The oil was considered valueless. Three months later the mulsh turned back to oil and water, and since then the well has been a steady producer of oil and water.

Since March 15, 1910, when the well first came in, it has produced 8,000,000 bbl. of oil, of which 6,000,000 bbl. were saved, thus earning nearly $3,000,000 for the Union Oil Company and its other owners. The Union Oil Company will drain the remaining oil and cement off the water if possible, and an effort will be made to drill deeper in the hope of further production.

Dunn, Barrett & Fried, owners of the land on which the Lakeview well is situated, have sold their royalty oil, consisting approximately of 1,000,000 bbl., to the Standard Oil Company at the rate of 30c. per bbl. The oil is stored in the large reservoir of the Union at Maricopa. In addition, the Union Oil Company has agreed to operate not less than one string of tools on section 25, where the Lakeview is situated, until 11 wells shall have been drilled. Drilling operations are to continue as long as oil shall be worth 20c. per bbl. or more. In return, Dunn, Barrett & Fried have dismissed the suit brought by them against the Union.

Organization of New York Section A. I. M. E.

The formal organization and election of officers of the New York Section of the American Institute of Mining Engineers took place on Sept. 22 at the United Engineering Societies building. All members of the Institute living within 50 miles of New York are regarded as members of the New York Section, the expenses of which are to be defrayed by voluntary contributions. The officers elected for the ensuing year were: Chairman, Benjamin B. Lawrence; vice-chairman, James Douglas; secretary-treasurer, Bradley Stoughton; these officers, with Charles P. Perin and George F. Kunz, constitute the board of directors. Regular meetings will be held on the first Friday of each month except during June, July and August.

At the meeting on Sept. 22, Charles P. Perin read a paper on the "Iron and Steel Industry of India." As consulting engineer for the Tata Iron and Steel Company, Mr. Perin had begun at Bombay and prospected across peninsular India to find the most suitable deposits of ore, flux and fuel. The works of this company were finally placed about 150 miles from Calcutta, where a 64 per cent. ore is delivered to the furnace bins at a cost of 46c. per ton; coke for $2.05; limestone for 64c. Labor costs from six to 40c. per day and the company is expecting production costs that at present prices would show a margin of about $6 per ton on pig iron and from $6 to $10 per ton on rails, bars and finished products. Besides the Tata Iron and Steel Company which expects to have its Kalimati plant in operation this autumn, the Bengal Iron and Steel Company, at Barrakar, is the only other important producer of iron and steel in India.

New Jersey Zinc Production

The well known Mine Hill zinc mines, at Franklin Furnace, in Sussex county, New Jersey, continued their important production of zinc throughout 1910, according to H. D. McCaskey, of the U. S. Geological Survey, sending 308,353 tons to the concentrating mills (producing 263,606 tons of concentrates), and 67,324 tons of crude ore to the smelteries. Figured as metallic zinc, the total recoverable output was 137,355,219 lb. of spelter, valued at $7,417,182.

The mines are opened by a vertical shaft 965 ft. deep, a slope to the 600-ft. level, and a shaft 1500 ft. deep on an incline of 47½ deg. The crushing plant has a capacity of 2240 tons per 24 hours and the separator a capacity of 1344 tons.

With Secretary Fisher in Alaska

By E. H. Thomas*

When Secretary of the Interior Walter L. Fisher and party, of which I was one, sailed from Seattle, Aug. 16, on the ss. "Admiral Sampson," it was to learn, as nearly as possible, the truth about Controller bay and the Bering River coalfields. If Mr. Fisher imagined he was to see unlimited quantities of coal exposed or developed in the Bering field with a market just yawning for the output, and evidence staring him in the face on every hand that the Guggenheims had prepared to gobble the 22 groups of coal lands located by the hundreds of claimants who had put down stakes, personally or by agent, he failed to realize expectations.

The Secretary had sent men into the field in advance of his own arrival. These men were under the leadership of Dr. Joseph Holmes, director of the U. S. Bureau of Mines, and were experts from the various coalfields of the country, identified with both the operating and engineering ends of the business. What the Secretary did not see for himself they did. With Mr. Fisher personally was Dr. Alfred H. Brooks, of the Geological Survey. The Secretary went prepared to get the truth, and he has it. What he may recommend is hard to say, even by one who was in touch with him daily, for the reason that it is difficult to see that anything can be done now to relieve the situation.

The goose that was to lay the golden egg was killed on the nest. Alaska must get another goose. In other words, industrial development of the territory must be reorganized from the ground up. It was a Guggenheim goose that sat in the lap of Alaska in 1907, and the bird represented a possible $50,000,000 investment.

Rich Copper Deposits

Away up in the heart of the Skolai mountains, as the middle section of the St. Elias-Wrangell range is called, were some wonderful copper deposits. Glance, running from 60 to 80 per cent. copper, comes in train-load lots from the Bonanza. Along Copper, Chitina and Nizina rivers, and on the islands of Prince William sound, are many low-grade mines in an advanced stage of development, the ores from which mix excellently with the high-grades of the interior. In the Bering River coalfield was a lot of good bituminous and anthracite badly shattered. It was found that the coal had excellent coking and steaming qualities. Now we have the elements of a great industry, coke, coal and ore within a short radius, all of which could be centered cheaply at a common tidewater point.

It was the creation of such a hive of industry at Cordova which brought the Alaska syndicate, so called, into existence. In hunting for an available tidewater point, Katalla and Valdez were tried and abandoned in favor of Cordova, after M. J. Heney had demonstrated that the way to the interior lay from the latter point.

What Might Have Been

If the Guggenheim plans had matured they would now be mining coal and making coke in the Bering coalfields; burning Alaska coal instead of California oil to operate their railroad, steamships and concentrator; would be smelting copper ore at Cordova with Alaska coke, instead of hauling it to Tacoma for reduction with coke shipped from Australia. Also, and better yet, if the Guggenheim plans had been permitted to mature a Canadian transcontinental railroad now under construction, would be operating its western division with Alaska coal, whereas Alaska is now buying British Columbia fuel.

After abandoning Katalla as a possible harbor and establishing Cordova, for the Katalla company never did consider Controller bay for a minute, the syndicate planned to build from Mile 39 on the Copper River & Northwestern to Katalla, and thence to the Cunningham claims via Bering lake. This road would have cost $6,000,000, and would have brought the coal from that field to Cordova over an easy grade in an 80-mile haul.

Before fuel oil invaded Alaska the territory was consuming less than 100,000 tons of coal annually. The Bering veins are so badly faulted, and the contents so crushed and shattered by a squeezing or slipping, or both, of the strata at some time in the formative period of the field that hardly one vein in six, so far as surface indications show, will produce coal solid enough to stand shipment to a market outside of that immediate region.

While the Guggenheims needed steam coal and coke, they did not require enough for their own use to justify the building of that line. With a contract to furnish coal to the new Canadian railroad, which called for from 45,000 to 60,000 tons of steam coal per month and covered a term of years, they had a guaranteed tonnage to back their investment.

The Guggenheims had the market in 1907 and 1908, but they could not get the

*Seattle, Wash.

coal. If they could get the coal now they would not have the market. How will a leasing bill relieve the situation? What good will it do now to pass any claims to patent? The outside market does not exist at present for coal in the physical condition characteristic of that field. Oil consumption in Alaska has taken the place of at least half of the actual requirements of the territory. The Treadwell, for instance, uses nearly 200,000 bbl. annually, and the president of the company told Mr. Fisher that coal would have to be laid down on their docks at less than $3 per ton to compete with the present fuel. The Alaska syndicate has spent $100,000 installing oil for use on its steamship and railroad and in its concentrator. Thus two of the largest coal users in the territory have put themselves out of the coal market. What can Congress or the Department of the Interior do that will put them in again?

When the Guggenheims were forced to abandon the coal enterprise they stopped work on all construction. The railroad operates two trains per week to the end of the line, and hauls about 65 tons of ore daily from the Bonanza mine. This tonnage not only represents the traffic of the road at present, but it represents all the traffic in sight until the industrial development of Alaska can be reestablished on a new basis, which will probably be that of oil consumption. In short, the territory must remain for some time a buyer of fuel, when, had it not been for politics and hysteria, it would now be a producer, and a possible exporter.

Alaska has been the football of politicians. That is what is the matter with it. Alaska is as much to blame as Washington, for Mr. Wickersham, the territorial delegate, invented the Guggenheim bogey, not knowing it was loaded with dynamite, and with it as an issue was elected as an independent against two regular party nominees.

The Bering Field

The assertion that the Guggenheims contemplated a monopoly of the Alaska coalfields was based on their attempt to acquire a half interest in the Cunningham claims. Analysis shows the charge to be unfounded. The Bering River is one of the smallest of the known Alaska fields, and the aggregate development is less than 3000 ft. of actual work. As a part of the Guggenheim plans a single group, comprising but 5 per cent. of the Bering area, would have been developed by that syndicate and a half of that 5 per cent. would have represented the Guggenheim holdings in the region. If 2½ per cent. meant monopoly, then they would have had a monopoly as charged. Of course theirs might have been the only operating company in the field. If a market developed for more cooal than the Cunningham claims could supply, there was the other 95 per cent. of the field to draw upon.

Neither did the Guggenheims have the only railroad project; for the Bruner road started a breakwater, which did not survive its first winter, by the way, and laid a whole mile of track. It was offered for sale to the Guggenheims, but they did not buy.

The Ryan road is a straight mark on the map drawn with reckless disregard for topography. At the shore end is a camp which "Jim" Ryan uses for a hunting lodge, as it is built on the finest duck marsh in all Alaska. The Guggenheims could buy it, but so far they have made no offer for it. If the public continues to entertain the belief, however, that there are billions of dollars worth of coal up there, with a world-wide market clamoring for the output, some enterprising person would doubtless be able to unload a liberal stock issue in the Ryan project. The Lippy-Davis people also drew a nice straight mark on a flat map and started some trestle on what was then a channel. The channel changed, however, and is about four miles out in front of the Ryan "terminals" this year.

Controller Bay Not the Key

Controller bay is a wind swept, open sheet of water of no depth. Back of the bay is a duck marsh, and back of the marsh is Bering glacier. This is the harbor which was to bottle up Alaska. A trip in a launch hunting for a "channel," and a nice little summer blow, which compelled abandonment of the launch and miles of hard tramping through the rain, with a wait of 18 hours for the sea to go down so we could board the "Tahoma," gave the cold, hard facts about Controller bay to the Secretary of the Interior.

The men in the field ahead of the Secretary reported that there is a large quantity of coal of good grade in a shattered condition. Faults and contortions, together with acute pinches prevail throughout the field, and they reported adversely on the field as one which can be mined economically. Nature has conserved it. Man can't use it it at present. It is there for Mr. Pinchot's future generations, and the world will soon forget it.

Katalla is a monument to our brief period of national insanity. Its streets are deserted and grass grown, for grass grows in Alaska, but the few hardy, brave souls left have turned their attention to the development of the oilfield there, and already a little refinery is in operation, turning out kerosene and gasolene from the oil pumped from a couple of shallow wells, and if a beneficent government does not take this resource away from them they will yet work out a destiny, worthy of Alaska's daring and resourceful people.

Steel Corporation Statement

The extraordinary fall in Steel Corporation stocks, consequent on rumors of the possible dissolution of the organization, are noted and commented on elsewhere. Late on Sept. 26—after the close of business—the following statement was issued, signed by J. Pierpont Morgan and E. H. Gary as a committee of the board of directors:

"Pursuant to the unanimous vote of the board of directors of the United States Steel Corporation at a meeting held this afternoon . . . . . the following statement is published:

"No negotiations whatever have taken place between the Steel Corporation and the Department of Justice looking to the dissolution or disintegration of the Corporation. The Corporation was organized for business reasons and purchased its various plants to promote such business and not to restrain trade or obtain a monopoly. In all its operations the company has scrupulously observed the law and recognized the just rights of its competitors and the consumers of its products. So far as its directors are aware, no complaint has ever been made against it by either of these interests. The directors are advised by its counsel that its existence is not in violation of the Sherman act as interpreted in the recent decisions of the Supreme Court.

"In view of this record and this advice the directors feel that their duty to their stockholders, their employees and the public requires that they should set at rest all rumors to the effect that they are contemplating any voluntary dissolution or disintegration of the Corporation, or have any belief that it is subject to such dissolution or disintegration by legal action. We believe that the organization is legal and that its management is proper. Its properties are of immense intrinsic value, and the Corporation is of benefit to the public interest."

The Volume of Business

Earlier in the day the following statement had been issued in relation to the current business of the corporation:

"Existing conditions are affecting business to the extent that instead of contract bookings for forward delivery customers are buying only for immediate requirements. Nevertheless, strange as it may seem, the volume of prompt business is larger than usual, specifications running upward of 30,000 tons per day. Of the 4,500,000 tons on the books, of which 920,000 tons is intercompany business, it may be said, from the standpoint of mill operations, it is better business than an old-time contract-order book of double the tonnage, inasmuch as it represents active business capable of specifications in sufficient volume as required to operate our mills on the present basis for some months to come."

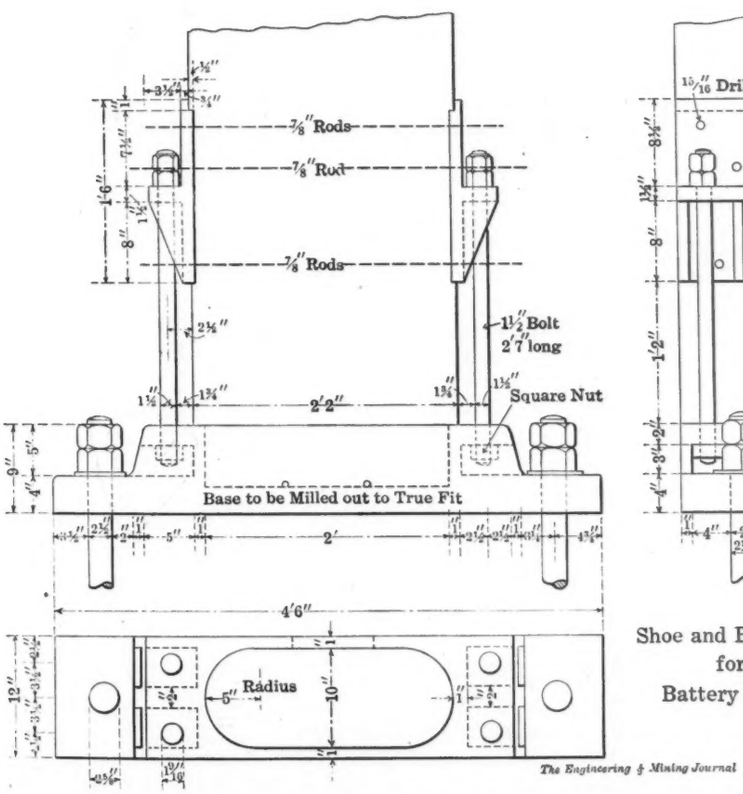
Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent to telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

A Method of Securing Battery Posts

The shoe and bracket for securing battery posts, shown in the accompanying illustration, and described by Francis W. Sewell[1], was designed for the Guanajuato Consolidated Mining and Milling Company.



Shoe and Bracket for Battery Post

The shoe is of cast iron and weighs 860 lb. It has a bearing surface on the concrete foundation 54x12 in. The shoe is secured to the foundation block by two 2½-in. rods, each 5 ft. long, threaded at both ends. The threaded portions are of enlarged cross-section, so that the diameter at the base of the thread is not less than that of the remainder of the rod. The lower ends of the rods pass through broad, square, cast-iron washers, embedded in concrete, and secured thereto by square nuts. Hexagonal nuts are used at the top end to hold down the shoe; lock nuts are shown in the accompanying sketch, but these are not necessary.

The shoe has a cavity cast in it, 24x10x 6 in. deep, with rounded ends, into which the foot of the battery post fits. The bottom of this cavity is milled so as to give an even bearing surface to the post. At each end of this shoe are cast suitable projections, bored vertically with 1 9/16-in. holes to receive the ends of 1½-in. bolts from the brackets. The two side brackets, which weigh about 100 lb. each, are recessed into the 12-in. faces of the posts, and secured in place by five ⅞-in. rods, which pass through the post from one bracket to the other. These rods are threaded at both ends. Nuts hold the brackets firmly in position. Passing vertically downward from each bracket to its respective end of the shoe are two rods, aforementioned, with square nuts to attach them to the shoe and hexagonal nuts to attach them to the bracket. The lowest part of the bracket is 14-in. above the top of the shoe, so it will be seen that once the post is set in position, with all the nuts tightly screwed down, there is little chance for any movement. With the exception of the lower nuts of the 2½-in. rods holding down the shoe, all the nuts are readily accessible and the rods connected with the side brackets are easily replaced.

In the erection of the battery the cavity is half filled with oil and the foot of the post is cut slightly larger than the cavity, the point being cut so as just to enter. Some specially long rods are passed up through the brackets from the shoe, and fitted with nuts, which, on being screwed down, force the post into the cavity. This action is aided by blows with heavy hammers on the top of the post. The oil is forced into the end of the grain of the wood and passes upward some distance. This insures that no moisture can lodge in the cavity to rot the post. Frequent applications of oil are given to the posts, until it soaks in slowly, indicating saturation, after which the posts are painted.

[1]Memoirs of the Mexican Institute of Mining and Metallurgy.

Placing Holes for Blasting

BY P. B. MACDONALD*

The subject of placing holes for blasting, formerly left entirely to the judgment of the miner and foreman, has lately received attention from engineers and superintendents. Wrong judgment in placing drill holes is one of the most expensive mistakes in underground work; expensive because of the loss of explosives and time in the costly operation of reblasting.

The following is an incident common in underground practice: A miner drills a cut of say 12 holes and blasts them. If the ground is tough, the misplacing of one hole upon the breaking of which the effects of several others depend, may spoil the blast so that large ridges or corners are left. He then cleans or blows out the holes which failed to break and uses from 10 to 40 sticks of dynamite, costing 10c. per stick, for blasting the same holes a second time. In almost every such instance one or two extra

*Mining engineer, Iron River, Mich.

holes or a closer attention to the position of the holes drilled, would have made the difference necessary to produce a successful blast in the first trial. The time spent on reblasting is usually more than would have been required for the added care in placing the holes, and the greater powder cost and the time consumed waiting for the smoke to clear, are distinct losses. The nature of rock excavation is such that a 5 per cent. closer attention to details may mean a 25 per cent. gain in results.

The simplest form of blasting is slicing or breaking to an open face. In opencut excavation, holes are drilled at a distance back from the face a little less than the depth of the hole, although this distance is shortened in tough igneous rock and where the blasted portion is held at the ends as in drawing back a narrow stope. A favorite arrangement of holes for use on bench work in opencuts is shown in Fig. 1. The horizontal holes are fired at the same time as the vertical holes, in this manner deepening the cut broken.

In drifting in soft rock, such as friable schist or crumbly slate, most of the standard arrangements of holes give good results and the misplacing of one or two does not usually matter. The arrangement shown in Fig. 2 is, of course, applicable only to soft rock where the blasting shatters the rock so thoroughly that it can be picked out. Fig. 3 shows a 10-hole cut with one back hole, frequently used in driving small drifts where it is desired to keep the back well arched. The arrangement shown in Fig. 4 is suited to larger square drifts. These holes would not break much hard rock because of the distance between the bottoms of the cutting-in and squaring-up holes.

It will be noted that Figs. 3 and 4, depicting standard cuts in soft rock, show two classes of holes, the cutting-in holes, and the squaring-up holes which determine the shape of the drift. In hard rock there are, in addition, what are conveniently called relief holes, because, situated and fired intermediately between the cutting-in and the squaring-up holes, they relieve the ground to be broken by the latter set. It is in the drilling of such a cut that the best judgment is required, for relief holes are a changeable feature and slight variations in the toughness of the ground and the size of the workings necessitate differently placed relief holes for successive cuts.

The most important rule to be observed in placing holes is that the determining factor is not the distance apart of the starting points of the holes but the distance between their bottoms. The upper few feet break out into the drifts comparatively easily, but the inner portion breaks with more difficulty. For instance, in Fig. 4 the tops of the holes are 2½ ft. apart, while between the bottom of the cutting-in and the bottom of the squaring-up holes is 4 ft. of rock, so that in hard ground the cut would not break. Experience in any variety of rock will show what unit may be figured upon for the dividing distance of the bottom of the hole, usually 2 or 2½ ft. The distance from the cutting-in to the relief holes is made less than from the relief to the squaring-up holes (figuring between bottoms in each case); possibly the former is 2 ft. and the latter 2½, because ostensibly the squaring-up holes have a better chance to break out in the space enlarged by the relief holes than the relief holes have in the confined space made by the cutting-in holes.

In planning the arrangement of holes the first consideration is to get a cutting-in hole that will break well. The smaller number of holes used for this, the better, because it is essential that cutting-in holes be fired simultaneously, and owing to irregularities in the rate of burning of fuse, this is difficult to accomplish when a large number of holes are to be fired; also, starting a cutting-in hole is often difficult because of the angle at which the drill point has to meet the face. The excavation made by three holes meeting at a point is almost as large as by five or six, so that it is usually better to use only three or four holes for cutting-in; and, if the ground requires them, to put the extra holes in as relief holes where they will break more ground.

After deciding upon the cutting-in, the squaring-up holes are placed along the sides, bottom and top, with the ground equally divided between their bottoms. Perhaps two relief holes, one on each side of the cutting-in holes will suffice; Fig. 5 shows two on either side and one above, helping the middle back hole, which is important because upon its

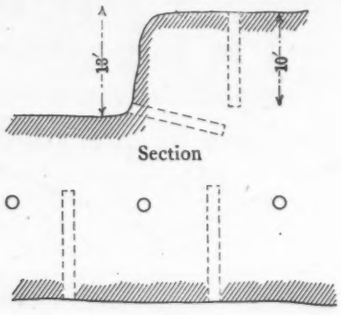


FIG. 1

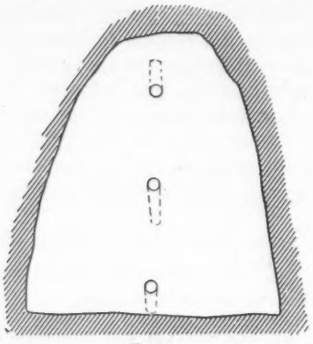


FIG. 2

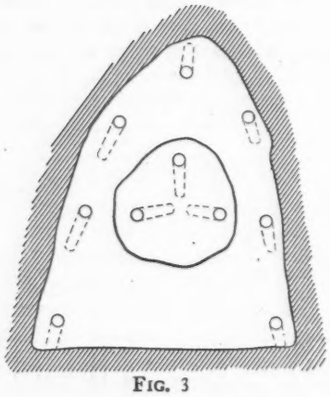


FIG. 3

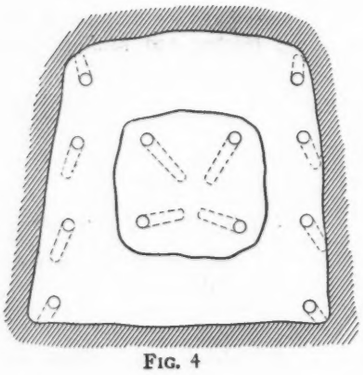


FIG. 4

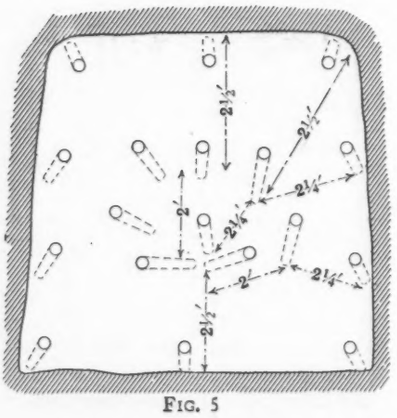


FIG. 5

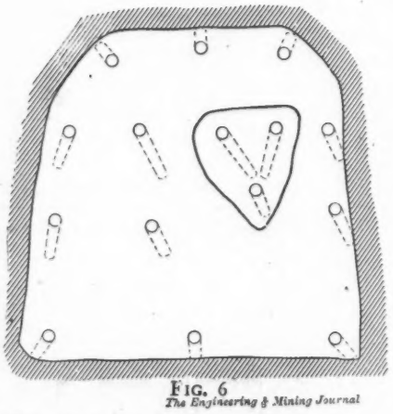


FIG. 6
The Engineering & Mining Journal

ARRANGEMENT OF DRILL HOLES IN OPENCUT AND TUNNEL WORK

breaking depends the successful blasting of the other two back holes. In the sketch the cutting-in holes are placed low; they might have been shifted higher and the upper relief holes placed underneath. Quite a common alternative is to shift the cutting-in holes to right or left, so that relief holes are required on but one side; thus in Fig. 6 it is seen that the cutting-in holes are to the right and high.

To sit in the office and figure the arrangement of holes for a cut is not satisfactory, unless the sketch is drawn to scale, because it is easy to draw the holes out of proportion without regard for practical considerations. The holes cannot be pointed at such an angle as is sometimes desirable because the crank end of the machine will strike the sides or back of the drift. It is generally good practice to drill as few dry holes (those which will not hold water) as possible, and this throws out many of the cuts drawn by men who never helped drill a sticky hack-hole; also it should be aimed to economize on movements of the arm and bar.

An inexperienced man examining the holes for a cut is apt to think that the deviation of the holes is at too small an angle, and that the holes are too straight. It is not an easy matter to tell definitely where the bottom of the holes will come, but for judging two relatively, the following method is frequently employed by mine foremen in checking a miner's holes. When one is finished a long drill or tamping rod can be inserted in the hole so that the end protrudes several feet, and the amount by which it approaches or diverges in two feet from a new hole being started, can be measured, from which the relative location of their bottoms can be gaged.

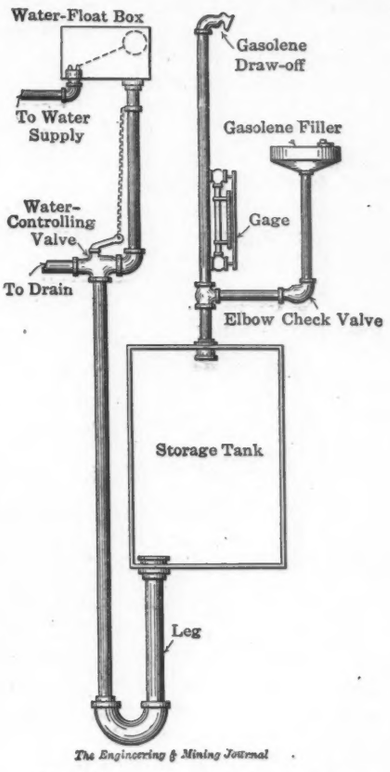
The structure of the rock plays an important part in the placing of holes for blasting. The presence of joints, fissures, faults or slips, and the texture of the rock affect the number of holes that are necessary and their position. A miner who is accustomed to drilling jointed sedimentary rocks is liable to underestimate the number of holes necessary for a tough igneous rock; contractors bidding on tunnel-driving contracts give this matter considerable attention. Again a miner who has been drilling igneous rock will be surprised that some of his holes in a sedimentary formation break so well, but that others do not break at all. Most miners know that in drilling a drift in sedimentary rock at right angles to the bedding plane, the ground breaks out much better than in drifting parallel to the formation, while in opencut work slabs lying along the bedding plane can be broken off easily.

It is stated (*Trans.* Min. and Met. Soc. of America) that about 64 per cent. of the rope breaks in mines occur on the down travel.

Storing Gasolene

A system of storing gasolene, applicable to the assay or melting furnace, and especially interesting in its application of natural laws, is described in *Shop Notes Quarterly*. It is known as the hydraulic system, and provides for the delivering of the gasolene from the faucet or draw-off by simply turning the cock or valve, and without requiring pumping.

The principles of operation depend upon the difference in density of water and gasolene; as, for example, 12 in. of water will balance approximately 70 in. of gasolene. In preparing for operation the system illustrated in the accompanying sketch, it is first filled with water by raising the lever of the water-controlling



HYDRAULIC-PRESSURE TANK FOR GASOLENE

valve. This single movement closes the port leading to the water-discharge pipe and opens the port leading to the water-float box, and allows the water to pass from the float box through the valve to the bottom of the storage tank, where it strikes a deflector and spreads evenly. The entering water displaces the air, forcing it up the gasolene-delivery pipe and out of the delivery nozzle. The lever should be held up until water appears in the gage glass, and then the tank is full of water and all air expelled.

Dropping the lever closes the port of the water-controlling valve which communicates with float box, and opens the port which communicates with water-discharge pipe, thus allowing the water in the gasolene pipe above the water-controlling valve to return to the storage tank and discharge an equal volume of water into the sewer or drain. The system is then ready to receive gasolene.

To fill with gasolene, the plug in the gasolene filler is unscrewed and the gasolene poured in. The gasolene passes down the piping into the top of the storage tank, where it strikes a deflector and spreads evenly over the surface of the water, forcing the water out of the tank through the water pipe and water-controlling valve to the sewer.

Gasolene can be poured in until the storage tank is completely filled, but it cannot be overfilled, thereby forcing the gasolene into the sewer, because the water column from the water-controlling valve down the pipe to a point level with the bottom of the storage tank is of sufficient length to balance a column of gasolene from the bottom of the storage tank up to the top of the gasolene filler. Therefore, when the tank is full of gasolene no more can be poured in, because it will overflow at the filler.

To draw gasolene the lever of the water-controlling valve is raised. This closes the water-discharge port and opens the port connecting the float box, and allows water to pass into the tank under the gasolene and force the gasolene from the top of the tank out of the delivery nozzle. When the lever is released the flow will instantly stop, and the gasolene in the delivery pipe will return to the storage tank.

Owing to the swing check valve in the filler pipe, no liquid can be forced up this pipe. After all the gasolene has been drawn, water will flow up the delivery pipe to the same level as the water in the float box, or about 6 in. below the level from which the gasolene is drawn. Therefore, no water can be drawn with gasolene from the system.

Reducing Wear on a Feeder Drive

BY ALGERNON DEL MAR*

The millman at the Fort Bidwell Consolidated mill has introduced a useful but perhaps not a novel device for a cushion on the feeder bar of the automatic feeder. The end of this bar is usually horseshoe shaped, to which a strip of leather is riveted. The leather often comes loose and is then a great annoyance, for the iron of the bar and the collar on the feed stem wear rapidly. The device which he has introduced and which I believe he saw used in Nevada county, Cal., is a ring of leather the pieces of which are riveted together. This fits loosely around the stem and has caused no trouble at all. It is always moving around the stem, so wears evenly.

*Mining engineer, Fort Bidwell, Cal.

Crane Service Record

By Percy E. Barbour*

At a copper smeltery operating four blast furnaces and two stands for converters, served by a 40-ton, 50-ft. span Morgan electric crane, continuous observations were made extending over one week to ascertain the exact service performed by the crane. The following is the log of the week.

	Minutes		
Changing converter shells	470		
Moving caps and cores	554		
Changing and lining converters		1024 =	17 hr. 4 min.
Tapping matte and charging	1907		
Transfering charges	213		
Doping	171		
Turning over converter	18		
Charging converters		2309 =	38 hr. 29 min.
Pouring matte and slag into beds and breaking up beds	384		
Skulling pots and ladles	440		
Granulating slag	1281		
Handling slag		2105 =	35 hr. 5 min.
Working for furnaces		75 =	1 hr. 15 min.
Crane down for repairs		164 =	2 hr. 44 min.
Crane idle		4403 =	73 hr. 23 min.
Total seven days.			168 hr.

During this run the converters were idle eight hours at one time and six hours at another, on account of there being no matte to handle.

Variable Capacity Compressor

The new compressor at the Tonopah-Belmont shaft, Tonopah, Nev., is giving especial satisfaction, both on account of the high efficiency at which it operates under widely changing load, due to the varying demands of the air drills in the mine, and because of the constant pressure that it maintains with a varying output of air The compressor is a 15x24x36-in. variable-capacity machine, having a delivery at 80 r.p.m. of 1500 cu.ft. per min. of free air, raised to a pressure of 90 lb. per sq.in.; at 100 r.p.m. of 1800 cu.ft., while at the usual speed of 84 r.p.m. it compresses 1580 cu.ft. of free air per min. The compressor is driven by a 250-h.p., type H. F., 440-volt, 60-cycle, three-phase Westinghouse motor, which is connected to the compressor by a leather belt at 30-ft. centers.

The compressor is fitted with an intercooler of the overhead, vertical type, the water for which is cooled in a cooling tower. By this means air, which was during a test, taken in at a temperature of about 50 deg. F., had a delivery temperature of approximately 200 deg. F. The valves are oiled by a pressure system, while the bearings are equipped with Nugent oiling devices.

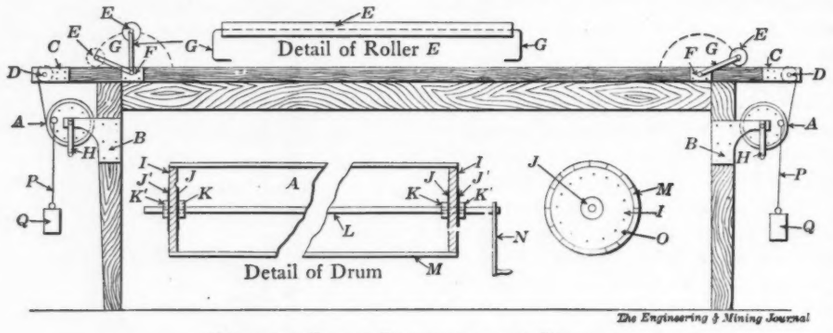
The air regulation is accomplished by means of an auxiliary piston balanced at the desired pressure, which, when the full volume of air is not required, moves upward, and by means of a full-stroke Nordberg valve gear actuates the inlet valves of the Corliss type before the suction stroke is completed. The air in the cylinder is then expanded below atmospheric pressure, or intercooler pressure in the case of the high-pressure cylinder, and compressed again during full stroke, so that the effect is to vary the working length of the stroke as required without any loss being involved in the process.

*Manager, Uwarra Mine Company, Candor, N. C.

Table for Large Mine Maps

By Clarence C. Semple

Where it is the practice to periodically outline the area of ground stoped, on the main mine map, it must be drawn to such a scale that, if the mine workings be extensive, the map will be inconveniently large. To facilitate handling and working on such a map, it may be drawn on several sheets of paper of convenient size. When, however, it is desired to see the work indicated on several sheets at the same time, a large table is needed on which to assemble the sheets. It is far more convenient to be able to refer to a map that is one sheet. The accompanying illustration shows a table similar to one used at the mine office of the North Star mine in California.



Drawing Table Equipped with Rollers

The map is drawn on heavy mounted drawing paper, the length of which is greater than the length of the table but of the same width. The ends of the paper are attached to the drums *A*, one of which is mounted at each end of the table. These drums are carried on a shaft *L*, turning in the brackets *B* screwed to the legs of the table. At each end of the table is a roller *D* made of a cylinder of wood into each end of which is driven a gudgeon. The gudgeons turn in a hole in the brackets *C*. These rollers prevent the paper coming in contact with the edge of the table. They are not absolutely necessary.

The rollers *E* are made of cylinders of wood through a passage through the center of which passes an iron rod *G*, turned at the protruding ends, as shown in the sketch. These ends fit in holes in the plates *F* at the sides, near the ends of the table. The roller *E* turns on the rod *G*, which is so mounted that the roller can be swung above the table as indicated by the dotted lines.

The rollers *E* are not essential; they act as brakes to keep the paper taut as the map is shifted by turning the handle *H* of the drums. These rollers should be fairly heavy. The table used at the North Star mines is not equipped with either the rollers *E* or *C*. They are of advantage when the paper is new and stiff.

The drums *A—A* may be made as follows: A ½- or ¾-in. rod of round iron is threaded for a distance of 4 in. at one end and 6 in. at the other. Two nuts, *K—K*, are then screwed to the end of the thread at each end of the rod. A large washer *J* is then slipped on the rod, next to which are placed the two disks of wood *I—I*, about 8 in. diameter. A second washer *J'* is placed against the outside face of each disk, and then the nuts *K'—K'* are screwed against the washers; by adjusting nuts *K'—K'* and *K—K*, the wooden disks can be adjusted to the desired distance apart and firmly held by tightening the nuts. Laths *M* are then tacked to the disks *I*, to make the surface of the drum. The threaded ends of the rod *L* are smoothed with a file to make journals for the ends of the rod turning in the holes in the brackets *B*. A handle *N* is attached to the longer end of the rod *L*. The end of the paper is tacked to one drum and enough rolled on the drum to give the required area for the map with a few feet to spare at each end.

To keep the map tightly stretched, a number of pins *O* may be driven into the face of one disk on each drum. A cord *P* with weight *Q* can then be hung on a pin of each drum, as shown in the illustration. In order to keep the portion of the map rolled on the drums clean, a box may be built around each drum with a slot in the cover for the map to pass through. The boxes will, however, interfere with the use of the weights and pins unless the shaft of the drum is extended far enough beyond the ends of the boxes to permit putting in a wooden disk for the pins that will be outside the box.

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The Cheshire Salt Industry

Description of salt making from the brine streams of Cheshire, an industry dating from the Roman occupation. Annual production about 1,000,000 tons.

NOTE—Excerpt from the *Chemical Trade Journal*, April 15, 1911.

The agitation which has been caused in the Northwich and Winsford districts of Cheshire, owing to the erection by the Salt Union, Ltd., of new works at Weston Point for the purpose of making salt, and the announcement made in the first week of April of the acquisition by Lever Brothers, Ltd., of a large area in Cheshire which possesses brine streams, with the accompanying questions of inter-county pumping and taxes, has drawn attention afresh to the resources still possessed by the country in the form of liquid brine. Interest in these resources, and the industries to which they have given rise, has been awakened afresh not only in Cheshire, but also in Lancashire, to which county Cheshire's brine resources have proved of large importance.

Long ere the great industries were thought of which have made Lancashire famous, Cheshire could boast of an industry—primitive, no doubt, but interesting in its character and methods. This was salt making, an industry which, in later times, made the fame of the Cheshire "Wiches," and brought prosperity to Northwich, Winsford, Middlewich, Winnington, and other towns in the Cheshire salt district. There are evidences that the enterprising Romans, when they pushed their way through the forests and over the hills and moorlands of Britain, found the brine streams of Cheshire and made salt from the brine in much the same way as it is made in the country today.

Formerly a Cottage Industry

From 150 to 200 years ago salt making was one of the cottage industries of Cheshire. The value of the clear and sparkling liquid which welled up copiously at different points in the salt district had been recognized. It was known that the liquid had but to be placed in a pot or "lead," and slowly evaporated over a fire, to yield 2½ or 2¾ lb. of white salt per gallon of solution dealt with. The salt was salable and the process of evaporation was simple. So the cottagers made salt industriously, and added to their family incomes. In order to obtain salt on a larger scale, the brine was conducted to "wich houses," as they were termed, and was then evaporated in "leads" or pans, the work of attending to the pans and of drawing out the salt after it had formed being done by women.

A tourist passing through the town of Northwich would find whole rows of houses which seemed to have been thrust out of perpendicular and out of all artistic form and comeliness by some wanton giant hand. On inquiring the meaning of this, he would be placidly told that that was nothing, and that the whole of the misangularity and distortion was due to the pumping of the brine. He would be told that masses of rock salt which lay beneath the town had been dissolved in part by the water which had reached it from the surface or from earth springs or streams, so forming brine, and that as this had been pumped up for salt making, cavities had been left, and as the pumping had gone on the support for the earth above had been removed, and there has been a settling down of the earth, a "subsi-dence" they called it, and that houses and buildings had settled down as the land had sunk.

Salt Area Comparatively Limited

The salt district of Cheshire is not so extensive as is commonly supposed. If a line be drawn from Northwich southward for five miles to Winsford, and then be continued for seven miles in a southeasterly direction to Wheelock, and then a line be drawn almost due north for 18 miles to Dunham Massey, and, curving gently round Heatley and Lymm, be carried back 10 miles to the southwest of Hartford, and a short connecting line be carried for two miles to the northeast, to strike Northwich again, within this area will lie the recognized brine district of Cheshire. The area, as plotted out, includes the new brine area of Heatley which has been acquired by Lever Brothers, Ltd. It does not, however, include an area at Lawton and Rode Heath, four miles southeast of Wheelock, where brine is known to exist. The brine streams flow in particular directions, and old salt makers or "brine pumpers" can point out their courses. If a new brine shaft had to be sunk it would have to be "on the run" of one of the streams, or brine would not be reached. An old brine pumper could point out a spot where a shaft, if sunk, would tap the stream.

Before the year 1889, when the Cheshire salt works came under the control of the Salt Union, Ltd., interesting episodes used to occur in pumping the brine for salt making. The works then belonged to different proprietors, and it sometimes happened that neighboring salt makers did not entertain neighborly feelings toward each other. Such feelings as did exist gave rise to the determination to pump each other out, and each would try to pump his neighbor "dry." So determined would a pumper be at times to pump his neighbor out, that his own pumps would be worked at their utmost, even though the brine were run to waste. Pumpers have been known to work their pumps at night—a very unusual thing in those days—and deliberately run the brine to waste in their determination to pump rivals "dry," so as to deprive them of their supplies of brine.

Brine Streams Capricious

The brine streams themselves are capricious, and have to be humored. Sometimes, without warning, a supply will fail. At other times the brine will become too weak to become of value. At such times the salt makers will stop pumping, and "give the stream a rest." In a short time it will be found that there is again a full supply of brine, and that the quality is as good as ever. Pumping will be resumed, and will continue until the stream grows moody or weary again. How great the demand which is now made upon the brine streams in the Cheshire salt district may be seen from the fact that the tax which in the past has been 2d. per 1000 gal. of brine, levied by the Northwich Salt Compensation Board to meet claims for damage done by subsidences, has been paid on quantities ranging from 500,000,000 to nearly 600,000,000 gal. per year.

To be profitable for salt making the brine must yield at least 2½ lb. of salt per gal. The yield is generally from 2 lb. 8 oz. to 2 lb. 9 oz. per gal. The specific gravity ranges from about 1.196 to 1.206, though weak and unworkable brines will be of practically any specific gravity between the lowest given and that of water. Makers calculate roughly on 1000 gal. of brine producing a ton of salt. In past years the yearly production of white salt has ranged from 900,000 to 1,000,000 tons; but latterly the production has been smaller. At the annual meeting of the Salt Union, Ltd., on March 17, George H. Cox, who presided, cheeringly foreshadowed a probable production of 900,000 tons being again reached.

A large proportion of the brine now regularly pumped in Cheshire is not, however, used for salt making, but serves as the base for the ammonia and the electrolytic soda-making industries. These now form two distinct and highly interesting and prosperous modern industries, the first being represented by the vast works of Brunner, Mond & Co., at Winnington, and with branch works elsewhere; the second by the Castner-

Kellner Alkali Company, Ltd., whose Cheshire and parent works are at Weston Point; and by the Electrolytic Alkali Company, Ltd., who, operating the interesting method of decomposing brine by electricity, invented by James Hargreaves, carry on works at Cledford Bridge, near Middlewich.

Pan Evaporation Still Used

The old pan process of evaporating the brine is still largely used at the Cheshire salt works. The writer has found rows of iron tanks, each about 60 ft. long, 24 ft. wide, and 20 in. deep, in use at works which he has visited. The tanks, or "pans," rested on brick walls, so built as to form flues, through which the heat could pass while in contact with the bottom of a pan, so as to cause the salt to crystallize out from the brine. The fires are under the front part of each pan, and the brine is heated to 90 deg. F. or 212 deg. F., according to the quality of the salt to be produced. The salt as it crystallizes may be white and pearl-like, or of a delicate green tint, the white, in places, shading imperceptibly into the green, and the green in other places seeming to brighten until it attains a soft, pearly whiteness.

The surface of the mass of salt in the pan is varied and beautiful, in parts being smooth and glistening, and in other places being serrated and pinnacled. All kinds of fantastic forms in tints of pearl or emerald may be noted as the eye traverses the crystalline expanse and views it through the clear brine.

The salt is drawn to the sides of the pans by long rakes, and is then lifted from the pans with shovels. In ordinary working a pan of the size given will yield from 22 to 25 tons of salt. Sixteen different grades or qualities of salt were stated to be made at the works in the Northwich district visited by the writer. Salt prepared for the table is known as "stove salt," from the circumstances of this salt, when put into the long molds by which the familiar blocks are formed, being placed for a time in heated rooms, or "stoves," as they are termed. The rougher grades of salt are used for fishery purposes, for soda making by the Leblanc process, in soap making and other industrial processes, and as a dressing for land.

One would think that the ceaseless dissolving away of the rock salt, and the remorseless pumping of the brine, would long ago have exhausted the rock-salt deposits of Cheshire. But beyond the sinking of the surface of the ground as seen at Northwich, there is nothing to show that any impression has been made on the vast stores of salt which have lain hidden away below the ground for untold ages in this part of the pleasant county of Cheshire.

The Anthracite Convention

Scranton Correspondence

A convention of the tri-district board of the United Mine Workers of America was held last week in Hazelton, Penn., the delegates to the convention being the officials of the three districts into which the anthracite mine region is divided, First, Seventh and Ninth. The convention of the three boards is only called on the eve of some momentous step being taken by the union. It is invariably held in anticipation of the expiration of the agreement with the operators, and this is the case in the present instance. The officials of the three districts draw up a series of demands in anticipation of the convention, and these are nominally ratified at the conference, ultimately to be submitted for reratification to the delegates of the various locals at the annual Miners' Convention which is held later on. This annual Miners' Convention is to take place this year in Pottsville, probably at the end of October, no date having yet been fixed.

The convention of the tri-district officers was held behind closed doors, but no secret has been made of the demands that will be formulated by the anthracite branch of the Miners' Union when the existing agreement expires. These are: (1) A general all-round increase in wages for all men working inside or outside of the mines; (2) A working day of eight hours; (3) Recognition of the union; (4) The weighing of the coal at the mouth of the shaft; (5) The check-off system. There are other demands of a minor character which will be incorporated in the proposition to be submitted to the operators after the existing agreement expires.

The district-board convention has not formulated a definite wage scale. They have demanded an increase in wages, but what the amount will be has not been publicly stated. One of the delegates to the convention declared, indeed, that nothing less than an increase in wages from 15 to 20 per cent. would satisfy them. It may be assumed that the anthracite miners will not ask for less than 15 per cent. increase on the present scale and the abolition of the sliding scale.

The eight-hour day has been one of the stereotyped demands of the miners since the union came into existence. It is an ideal kept in view rather than a question of practical labor politics. There is not a miner in the anthracite regions who works eight hours a day, regularly, on a shift, and there are few men employed around the mines in any capacity who do. Those who work over eight hours a day are not as a rule members of the union. The recognition of the union has been long a bone of contention between the miners and the operators. It is in reality a purely theoretical issue. When disputes arise, the officials of the union and the officers of the coal companies invariably come together, and as a rule, effect an agreement, when they do so, in all minor matters of contention. The three-year agreements that have been so honorably and satisfactorily maintained on each side, were negotiated and signed by the national officers of the miners' union on the one hand, and by the representatives of the operators on the other.

The weighing of coal at the mouth of the shaft is opposed by all of the miners of the Seventh district. They do not demand, much less want, this innovation. It is generally physically impracticable throughout the anthracite regions, where coal from the same mine may be hoisted in one place, drawn through a slope in another and hauled to a breaker a mile or two distant in another instance. It is the opinion of the more experienced miners that the weighing of coal at the shaft mouth would lead to a decrease in their due bills rather than an increase.

The check-off system is a demand that the operators deduct the union dues from the wages earned. The officials of the miners' union claim that this is a general practice throughout the soft-coal regions and its introduction into the anthracite regions is both legitimate and reasonable. The operators do not look at the matter in that light.

It is stated that the award of the Anthracite Commission received a great deal of consideration from the delegates to the conference. As the proceedings were private, no detailed report of the debate on this point is to be had. But since the officers of the union were frankly communicative, none is needed. They say that the award was an excellent one when it was handed down by the commissioners; but that things have radically changed within the past nine years. The cost of living, they declare, has increased enormously, while there has been no advance on the 10 per cent. increase that was made in the award. The sliding scale fluctuates so much from month to month that it is more or less a a cause of demoralizing perturbation in the wage issue, they declare.

The conciliation board was also under discussion, and the consensus of opinion among the delegates was unfavorable to its continuance. Its abolition will probably be demanded when the agreement is brought up for consideration between the representatives of the miners and the operators in the spring. The delegates declared that when questions in dispute are submitted to the conciliation board, the proceedings are so dilatory that the grievance is almost forgotten, if it is not an oppressive one, before a decision is rendered, and when a decision is rendered, they claim that it is invariably in the interests of the operators.

Since a great deal will be heard during the next six months of "grievances and

demands," it may be as well to explain here what these two words mean, in the terminology of miners' discussions. "Grievance" indicates that the miners are not quite satisfied with conditions as they exist. They want a change, and until that change is produced, whether it is for better or worse, a grievance exists. Of course, there are concrete grievances, more or less accentuated from the theoretical grievances. A "demand" is the formulation, oratorical or definite, of a grievance. A demand may be in the air for months before it is brought to the notice of the operators officially. Demands are, in nine instances out of ten, merely academic.

Equalizing Coke Rates

WASHINGTON CORRESPONDENCE

Representatives of Western plants, notably of some situated in Chicago, have visited Washington within the past few days for the purpose of securing information from the Interstate Commerce Commission regarding its intentions as to the changes in railroad coke rate from the Pennsylvania regions to Chicago and other points taking Chicago rates. The rates up to a short time ago were $2.65 and $2.35, according to the uses for which the coke was intended, about 90 or 95 per cent. of the westbound coke moving at $2.35. In making classifications more uniform, rates on coke were lately fixed at a general charge of $2.50 per ton on the ground that this was a general averaging of the charges which would do substantial justice.

This view was resisted by the shippers and the Interstate Commerce Commission seemed for a good while inclined to uphold their informal remonstrances, but later failed to do so. The result has been a formal complaint to the commission, and the coke rate will now be investigated with care during the coming fall months. One of the chief critics of the proposed new rate of $2.50 is the International Harvester Company, which makes its own steel at South Chicago.

The coke controversy is arousing an unusual degree of interest, because of the way in which the rate was passed. For some time past, the Interstate Commerce Commission has been urging that uniform classification be adopted by the railroads; but comparatively little attention has been given the subject. Since the adverse decisions in the advanced rate cases, however, there has been a good deal more activity than at any previous time and rates have been changed quite freely to make them accord in general with the uniform-classification idea. In this process, the tendency has evidently been to raise the lower rates in nearly every case to the level of the higher ones on the same or similar commodities, thereby bringing about uniformity at the same time that the new rates are made to constitute a considerable advance over the old ones. The inquiry into coke rates will probably touch on this phase of the situation; other complaints which are to be filed in consequence of advances on heavy commodities brought about through this same process of standardization, will also emphasize the question.

Inspiration Copper Company

GLOBE CORRESPONDENCE

W. H. Aldridge, of Los Angeles, managing director of the Inspiration Copper Company, who has been at the property recently, issued the first official statement regarding the new mill and the latest official report of the developed ore tonnage. He said:

"A number of the preliminary plans of the mill and of the mining equipment have been completed and J. M. Callow, associated with us as consulting metallurgical engineer, has made definite recommendations as to the flow sheet to be adopted for Inspiration ores. It is largely a copy of Utah Copper practice but carries a step farther the roughing system which has done so much in improving the recoveries from the ores of the 'porphyry coppers.' It has not yet been definitely determined whether the mill will be so situated that the ore will be hauled to the water or that the water will be pumped to the ore. An intermediate course involving a haul of less than three miles may be adopted. Charles H. Repath, who is designing the mill, is also at work on the plans for the new Cole-Ryan smeltery at Douglas, and for the new United Verde smeltery at Jerome. The ore now blocked out at the Inspiration amounts to approximately 30,000,000 tons averaging 1.95 per cent. copper. Adding to this tonnage the tonnage reported to be developed by Miami, Keystone and Live Oak, the Miami-Inspiration orebody can now be counted upon to yield over 62,000,000 tons of ore averaging 2.25 per cent. copper and ranks third among the big porphyry orebodies."

Trust Cases in Washington

WASHINGTON CORRESPONDENCE

Developments in the stock market during the last few days are being closely watched in Washington because of their close connection with the position of the U. S. Steel Corporation and of the American Smelting and Refining Company. The sensational break in the shares of these two combinations is ascribed partly to industrial conditions, but it is freely admitted that the recent utterances of President Taft and of Attorney General Wickersham have had an important bearing on the situation. The probable policy of the Government toward the concerns in question is now a foremost topic in Government circles.

Careful inquiry does not substantiate the extravagant statements lately made with reference to the policy of the Government toward these two corporations. There is nothing here to show that any definite decision has been reached as to the policy to be pursued by the Government. It is believed that consultations between the President and the Attorney General will occur upon the return of the Executive from his Western tour.

The complete text of the first part of the report of the Bureau of Corporations on the Steel Corporation will be issued here shortly. A preliminary summary was made public about three months ago. The full text will contain many new details. It is learned at the Bureau of Corporations that the second part of the report is likely to be held back for a good while, probably until the President's return, although officials will not admit in so many words that the delay will be so long.

Mining Industry of India

In 1910, an average of 144,680 persons was employed in and about the mines of India. Of these 89,778 worked underground, and 54,902 on the surface; 91,713 were adult males, 47,963 adult females, and 5004 children under 12 years of age. This was an increase of 3970 over the number employed in 1909.

The coal output was 12,047,413 tons; mica, 22,670; manganese ore, 758,949, which averaged 18c. per unit returns. The output of gems was 262,097 carats, of which 262,019 was from the Burma ruby mines. There was a small output of diamonds from the Koornool district of Madras, but the mine closed toward the end of the year.

The gold output decreased 3269 oz. from the 1909 production to 573,120 oz. in 1910. The various companies working in the Dharwar goldfield have determined, after spending over £500,000, to give up further work. The greatest depth attained was 1260 ft. These reef deposits did not prove rich in depth, and were untreatable by the ordinary cyanide process, although cyanidation and agitation are now being tried.

Iron-ore production amounted to 42,653 tons for the province of Bengal, and 11,973 from other sources, the total value amounting to only $47,681. Oil production amounted to 214,829,647 gal., ranking next to coal and gold in value, while salt was next with a production of 1,552,975 tons. Saltpeter had a production of 15,541 tons.

The asphalt production from Trinidad lake, on the isle of Trinidad, in 1910, was approximately 110,000 tons, an increase of about 8000 tons over the production of the previous years. The property is owned by the Barber Asphalt Company.

Dredge Building in California

By Lewis H. Eddy*

In California, 24 dredges are to be built during 1911 for operation in that State, Alaska, Idaho, Montana and Nevada. The cost varies from $35,000 to $275,000 each; the buckets from 1¼ to 15 cu.ft.; and the yardage from 15,000 to 350,000 cu.yd. per month.

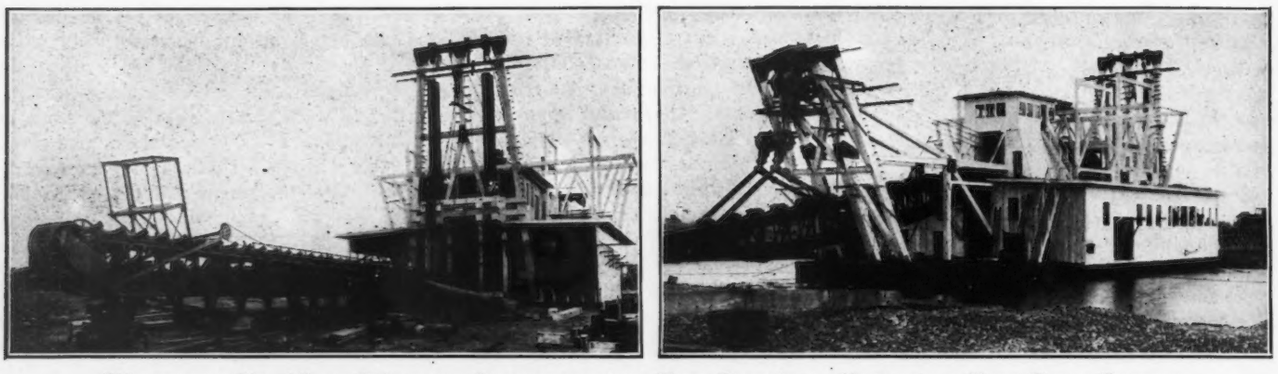
*State Mining Bureau, San Francisco, Cal.

The California builders of placer-mining dredges have completed, or have under construction for completion, in the present year 24 dredges of the bucket-elevator type, varying in construction cost from $35,000 to $275,000 each. Ten of these are designed for operation in California fields; the remainder are distributed as follows: Alaska, 10; Idaho, two; Montana, one; Nevada, one. The buckets range from 1¼ to 15 cu.ft.; the yardage from 15,000 to 350,000 cu.yd. per month. The varying constructional features include both open- and close-connected bucket lines; wooden and steel hulls; steel spuds and wooden spuds with steel points, and anchor lines; the equipment may be with or without tailing conveyer, and with or without monitor, as the topography of the land or the aggregation of dredging material may require; the power equipments include steam, electricity and gasolene. In addition to the bucket dredge, the steam-shovel and suction-pump types are attracting designers and builders, and their adaptability is being demonstrated in ground not otherwise economically dredgeable.

In the last 10 years electricity and gasolene have supplanted steam where economically available, and the close-connected bucket and the belt conveyer have predominated in most fields. The tendency toward increased capacity and greater efficiency culminated in January, 1911, in the installation on American river of the first of five boats of 15 cu.ft. bucket capacity, designed to dig 60 to 70 ft. below the water line, with yardage capacity of 300,000 cu.yd. of gravel per month. These boats were designed and built by the Yuba Construction Company, a W. P. Hammon corporation, and installed by the dredge-operating companies organized and conducted by the same interests, on the American, Yuba and Feather rivers.

There are two manufacturing plants directly engaged in the general business of designing, constructing, and installing placer-mining dredges: The Yuba Construction Company at Marysville, and the Union Iron Works Company at San Francisco. The Union Construction Company, of San Francisco, also engaged in the general business of designing and installing dredges, contracts for its structural and machining work with various machinery manufacturers in San Francisco. The Straub Manufacturing Company, of Oakland, builds dredges, and other large and small manufacturers of mining machinery in San Francisco, Oakland and Los Angeles have built bucket dredges or parts, chiefly from designs furnished by the companies installing them. The Byron Jackson Machine Works, San Francisco, makes a specialty of designing, constructing and installing suction dredges; and the Krogh Manufacturing Company, San Francisco, builds pumps for suction dredges.

The larger dredge-operating companies have structural shops on or adjacent to the dredging lands and do their own structural work, obtaining the parts from California or Eastern manufacturers. In some fields the shops are engaged only in repair work. The principal shops at the dredging grounds are: Natomas Consolidated, at Natoma and Thermalito; Yuba Consolidated, at Hammonton; Marysville Gold Dredging Company, at Marigold; Oro Water Light and Power Company, at Oroville.



"MARYSVILLE NO. 4," AN 8½-CU.FT. CLOSE-CONNECTED TYPE DREDGE AT MARYSVILLE, YUBA BASIN DIVISION

EVOLUTION OF CALIFORNIA TYPE

The present standard of the California type of gold dredge was evolved from the first successful single-lift, bucket-elevator dredge built by the Risdon Iron and Locomotive Works and installed by W. P. Hammon and the late Thomas Couch on Feather river at Oroville in 1898. This was a 3¼-cu.ft. open-connected bucket dredge, steam driven, and equipped with bucket tailing-stacker; designed to dig 25 ft. below the water line, and yardage capacity of 35,000 cu.yd. per month. This type of dredge predominated for several years, although the double-lift type equipped with tail sluices and tail scow was introduced and partially successful. In 1901 the double lift was wholly discarded, and in that year the first electric-driven, single-lift, close-connected, bucket-elevator dredge, equipped with belt conveyer, was installed at Oroville.

RISDON THE PIONEER BUILDER

The Risdon Iron and Locomotive Works constructed the first single-lift, bucket-elevator type of gold dredge in California in 1897. This dredge was wrecked on Yuba river, proving the requirement of larger and stronger boats for this river owing to its turbulency. The second dredge of this type was built by the Risdon and was successfully installed on Feather river at Oroville.

From 1897 to 1910 inclusive, the Risdon built 71 dredges, ranging in bucket size from 2½ to 7 cu.ft., and varying in cost from $35,000 to $95,000 each. The last dredge completed in 1910 was installed at Forest Hill, Placer county, Cal., in August of that year, by the Eldorado Placer Dredging Company. This is a 3½-cu.ft., open-connected bucket type, digging 45 ft. below and stacking 25 ft. above the water line, having a capacity of 45,000 cu.yd. per month; electric-driven, equipped with four G. E. motors, total power 125 h.p. In 1911, prior to the transfer of the dredge-building plant and business to the Union Iron Works, the Risdon had com-

pleted and under construction six dredges for installation in California, Alaska, Montana and Nevada.

Union Works Acquires Risdon

The Union Iron Works Company was established in San Francisco in 1849, and while engaged in the manufacture of various classes of mining machinery gained its greatest repute in shipbuilding. Dredge building by this company was begun in 1909; and up to the date of taking over the plant and business of the Risdon Iron and Locomotive Works dredge department, in July, 1911, it constructed six dredges installed in California and Alaska. These dredges range in bucket capacity from 2½ to 9½ cu.ft. and in yardage from 25,000 to 100,000 cu.yd. per month.

In acquiring the Risdon the Union Iron Works has placed in charge of its dredge-building department R. H. Postlethwaite as general manager of the mining department, and George L. Hurst as manager of the gold-dredging department, who have been identified in those positions with the Risdon for the last 11 years. In that period there has been notable advancement in constructional features and general and specific efficiency of the Risdon dredge.

The Risdon buckets are now made heavier and stronger. A bucket cast in one piece is generally employed; it is absolutely watertight. The Risdon has tried out a number of close-connected buckets of various types and designs in the hardest character of digging, and introduced manganese buckets for this kind of work; and though so far the results attained by the close-connected type have been satisfactory, the good qualities of both open- and close-connected have been retained so far as possible. And since both open- and close-connected types, of various designs, have been placed in the same bucket line on several Risdon dredges the results are carefully noted to ascertain which makes the better showing. The close-connected bucket, however, has proved to the satisfaction of the Risdon builders to be the best for all conditions except in ground containing exceedingly large stones.

There has been great advancement in the construction of tumblers. The lower tumbler bearings are all improved, the present design being much simplified and a notable improvement over all former designs. The top tumbler improvements consist in the elimination of a number of rivets and bolts, and the putting in of as few large bolts as possible so that there is less loss of time in the tightening.

The bucket or digging ladders, both the trussed and the plate-girder types, have been strengthened and are universally fitted with sluiceway so that material dropping out of the top tumbler is carried down to the lower tumbler where it is again picked up by the buckets. Belt conveyers, or stackers, continue to be the favorite method of taking care of the tailings, though the bucket stacker has good points and in some places is the only method of handling heavy material.

Revolving Screens Most Used

The Risdon patented revolving screen is almost universally employed, shaking screens having been practically all abandoned. Revolving-screen construction has been improved and simplified, so that the perforated plates can now be renewed without dismantling the screen. Insteady of being riveted in, the plates are now held in place by means of bolts fitted with spring washers; and it now requires but a few hours' work to remove an old plate and put in a new one.

Gold-saving methods are practically the same as for several years past. While a number of electro-amalgam devices are being tried out, no satisfactory practical results have been made public. The area of the gold-saving tables has always been inadequate to the largest-capacity dredges, and improvements in this direction are greatly in demand.

In the building of hulls structural steel has been combined with timber framing, thus eliminating all the cast-iron parts; and a thorough system of trussing the hulls to withstand the strain in hard ground also has added to the life of the dredge. While the size of the dredge is continually increasing, and there seems to be no limit to the possibility or the demand, the Union Iron Works, carrying out the Risdon idea, holds that for isolated places, particularly at points distant from rail- or water-transportation facilities, the large dredge is not so much in favor, owing to the difficulty of handling large pieces of machinery by team in the transportation of dredge parts.

Yuba Company Formed by Hammon

The extensive dredging operations of W. P. Hammon and associates, initiated on Feather river, at Oroville, in 1898, and since extended to the Yuba and American, and on smaller scale to the Bear and Calaveras rivers, had for several years required the maintenance of large structural and machine shops to insure expeditious and economic assembling of parts in the installation of dredges. The first of these shops was established in Oroville. The continued expansion of dredging operations, requiring special construction and constant increase in the number of dredges to meet the demands of rapidly accumulated acreage, induced the incorporation of the Yuba Construction Company in 1905, with an initial capital stock of $200,000, since increased to $1,000,000, and the establishment of a large plant at Marysville.

The officers of the company are: W. P. Hammon, president; Newton Cleaveland, vice-president and general manager; E. P. Jones, resident superintendent. To this executive force have recently been added the services of S. L. G. Knox, who until a short time ago was vice-president and chief engineer of the Bucyrus Company of South Milwaukee, Wis. The head office of the company is in the Alaska Commercial building, San Francisco.

In January, 1911, the Yuba Construction Company bought the business of the Western Engineering and Construction Company; and within the present year has taken the agency of the Bucyrus Company for Alaska. Both companies had planned to enter the Alaska field as builders of dredges, and the agency agreement was undertaken in order to avoid unnecessary competition and to economize in the maintenance of representatives in that territory. The Yuba Construction Company had already made a beginning in that field with the construction in the summer of 1910 of a 4-cu.ft. dredge for the Wild Goose Mining and Trading Company, at Council City, Nome; and in the summer of 1911 had designed two steel hulls for dredges now being completed at Dawson for the Yukon Gold Company. A complete dredge is now in course of construction at the Marysville shops for installation at Nome.

The situation of the Marysville plant of the Yuba Construction Company places the initial construction work in the proximate center of the three chief dredging fields of the State, with transportation advantages of two main-line railroads, and hourly electric-car passenger service, north to Oroville and Chico and south to Sacramento. The plant is composed of five departments housed in four buildings. The forge shop is 100x100 ft., the structural shop 100x150 ft., in a steel-frame building, and equipped with specially selected modern tools. The machine shops occupy a reinforced-concrete building 100x250 ft. The power house is equipped with a 500-h.p. G. E. alternating-current motor, running the compressor and direct-current converter for shop tools, and occupies a 40x60-ft. ground space. The fourth building is the storehouse, 80x150 ft. Besides the working plant, the superintendent's office, engineering department and clerical offices occupy a separate building of wood-frame construction 60x90 feet.

The entire steel work of the dredges, with the exception of certain castings, is manufactured in this plant; the wooden parts of the dredges are built at the flotation sites in the field, where the several steel parts are assembled as required. At the construction plant the number of men employed, including skilled and unskilled workmen, engineers, draftsmen and clerical force, averages 200 daily in the year. In field construction the number of men required from the building of the hull to the commission of the boat, including carpenters, builders, machinists, electricians, will aver-

age 80 for six months, in the completion of one of the 15-cu.ft. dredges, the maximum number per day reaching 110, and the minimum 40 men.

Results of Five Years' Operation

The Yuba Construction Company has built 23 new dredges, reconstructed two, and has three under construction. These dredges vary in construction cost from $80,000 to $275,000 each, and range in bucket size from 5 to 15 cu.ft., and yardage from 70,000 to 350,000 cu.yd. of gravel per month. The designing and constructing of dredges by this company is not confined to the requirements of the dredge-operating companies represented by the Hammon interests, but extends to other operators in the Pacific Coast States and Alaska. Of the total 28 dredges mentioned, 18 were designed and built for the Hammon interests.

Since the operating policy of the Hammon companies has tended toward deeper digging and constantly increased capacity, there has developed in the shops of the Yuba Construction Company greater advancement in the size and strength of boats, capacity of buckets and yardage output than in any other dredge-construction plant, so far as at present known, in North America. Whether the limit has been reached in the 15-cu.ft. dredge handling 350,000 cu.yd. of gravel per month is wholly a question of the demands of expeditious and economic field operation.

Nozzles Displace Spray Pipes

The essential improvements made by this company in dredge construction besides size, strength and capacity, apply to almost every detail of the various parts. One of the apparently simple but economically effective improvements is the substitution of nozzles for the spray pipe employed for washing the gravel passing through the revolving screen. A brief description of the application of the nozzle-washing device to an average dredge of 7½-cu.ft. bucket size will illustrate the method. The revolving screen is of the straight type, 6 ft. in diameter and 35 ft. long, constructed of removable plates; the upper sets of plates are perforated with ⅜-in. holes, the lower sets with ⅝-in. holes. The nozzles are made of 3-in. pipe, the size of the stream varying from 1½ in. to 2 in. Five nozzles, delivering 1¾-in. and 2-in. streams, are placed at the upper end of the screen, and seven nozzles delivering a 1½-in. stream each at the lower end. The water is driven by an 8-in. and a 10-in. centrifugal pump, having 60-ft. head rating.

The advantages demonstrated by the substitution of the nozzles for the spray pipe are: The development of a greater body of water; greater force of stream from practically the same pressure; increased agitation and disintegration of the gravel; increased cleansing capacity of the water; larger supply and improved quality of the sands going to the tables; and permitting the maximum yardage capacity of the dredge.

The digging end of the dredge had in the earlier designs exceeded the capacity for washing and screening the gravel. While this defect was in a measure remedied by increased screening area and additional volume of water under high pressure and the substitution of the revolving screen for the shaking screen, still the digging capacity exceeded the washing and the maximum of sands on the plates was not being obtained.

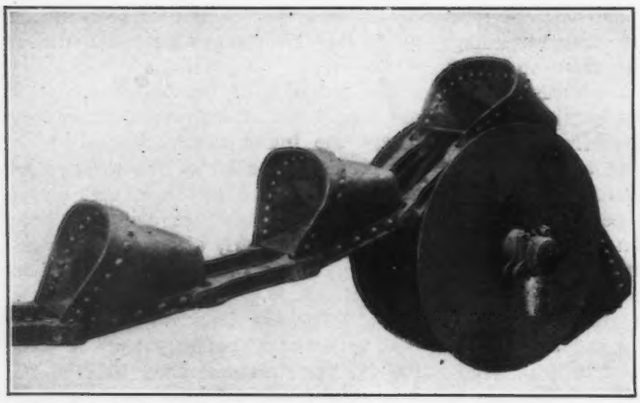
The spray pipe, extending the full length of the screen and having the same pitch, delivers the water in only one direction through ½-in. holes, lessening the force of the stream under practically the same pressure applied to the nozzles; the spray-pipe streams moving with and in the same direction that the gravel is carried, lack the hydraulic effect created by the opposite action of the streams from the nozzles, so that there is less agitation of the gravel and a resultant lack of cleansing capacity; *de facto*, a smaller quantity of water delivered from the same supply and with less force under the same pressure, must reduce the maximum result.

Two-Lug Bucket Is Economical

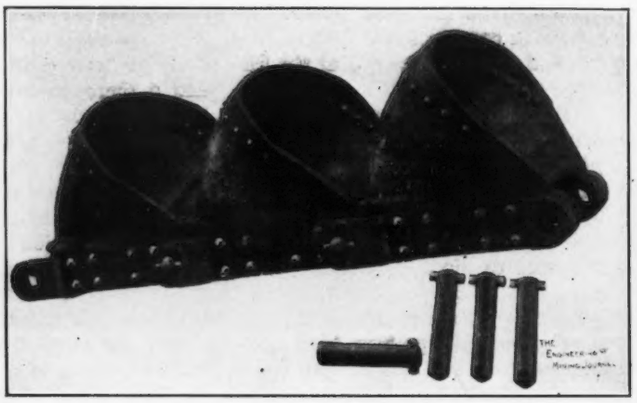
The improvement in the construction of buckets has not been confined to increasing the capacity, but extends to economy in construction and operation by the complete adoption of the two-lug bucket in place of the three-lug; as fast as the latter are worn out the type is discarded from all the dredges operated by the Hammon companies. The economy in construction is in the lessening of the cost of machining; and in operation there is economy not only in reducing the mechanical difficulties resulting from breakage and wear, but in lessening the essential weight of the bucket. An average bucket of 1400 lb. of the three-lug type weighs approximately 300 lb. more than a corresponding two-lug type; this additional weight may be better applied to the strengthening of other essential parts.

The three-lug type is designed with three eyes in the forward or open end of the bucket and two eyes in the back or bottom end, the middle eye of the forward end fitting between the two eyes of the preceding bucket in line. The two-lug type has two eyes in front and one at the rear, the single eye fitting between the two forward eyes of the following bucket in the line. The eye of the three-lug is necessarily smaller than the eye of the two-lug, and the reach between the eyes being reduced, the wear is heavier. The increased size of the eye of the two-lug bucket requires a larger and consequently heavier and stronger pin, there is less resistance and the wear is reduced in proportion, and the breaking of the steel between the two back eyes of the three-lug bucket is, of course, thus eliminated.

The buckets made by the Yuba Construction Company are mostly in three parts, bottoms, hoods and lips cut separately, though the company supplies also the bottom and hood cut in one piece. The life of the bottom of the three-part



'Lower Tumbler and 1¼-cu.ft. Buckets Used on Smallest Successful Dredge Built



Risdon 4-cu.ft. Close-connected Buckets with Pins

bucket is approximately two years, and of the lip and the hood about one year. The bucket, as well as the whole of the dredge, and other special parts, are designed to meet the requirements of the ground to be worked; so there may be variance between the weight of buckets in different fields, or the lip, the hood or the bottom may or may not be especially strengthened, the mouth may be wide or narrow, or the bucket deep or shallow, as the particular field may require; but always in the present practice of this company new buckets are designed of the two-lug type. Also this company finds greater economy and larger results from the employment of the close-connected type of bucket, showing an increase of 35 to 40 per cent. in yardage and a decrease of 25 per cent. in power consumption per yard dug, over the open-connected type under the same or similar conditions.

Three new dredges were designed and installed by the Union Construction Company in 1910, and three more are in course of completion in the present year. This company was not incorporated until January, 1911, and has not yet undertaken the establishment of a construction plant, depending on machinery manufacturers in San Francisco for the parts essential to dredges designed and installed for mining companies in California and Alaska. One dredge is being reconstructed in California. The new dredges range in bucket size from 2½ to 3½ cu.ft., and vary in cost from $40,000 to $50,000 each. The office of the company is at 604 Mission street, San Francisco. W. W. Johnson is president, H. G. Peake, engineer.

Two dredges for installation at Nome, Alaska, have been built by the Straub Manufacturing Company, 429 Third street, Oakland, and two are in course of construction for the same field. This company makes a specialty of mining machinery, particularly crushing and roller mills for handling quartz ores. Dredge building has been added in the last two years. The dredges are built from designs furnished by the operators, and are of late type, including the revolving screen and tailing belt conveyer.

Distribution of Dredges Built in 1911

The distribution and description of dredges built in the present year by California manufacturers are here restricted chiefly to those for installation in Alaska, Idaho, Montana and Nevada, since most of those built for California fields have been described in former issues of the Journal[1]. Those not so described are mentioned later in this article.

A complete history of the gold-dredging industry in California and Alaska, and other Pacific Coast fields may be found in the Journal files and State Mining Bureau publications.[2] The following lists include all the gold dredges built or under construction by California builders in 1911 for the fields named, so far as information is at present available.

Alaska—Built by Risdon Iron and Locomotive Works. Two dredges: One for James Kelleher, Kougarok, 2½-cu.ft., open-connected bucket, 50-ft. digging ladder, 44-ft. belt-conveyer; gasolene driven, four Union engines, total power, 102 h.p.; capacity, 35,000 cu.yd. per month; to be sledded in over the ice for installation in 1912. One for (name withheld), Nome, 1¼-cu.ft., open-connected bucket, to dig 15 ft., without tailing conveyer; gasolene driven, one Union engine, 30 h.p.; capacity, 15,000 cu.yd. per month; designed mainly for digging sand.

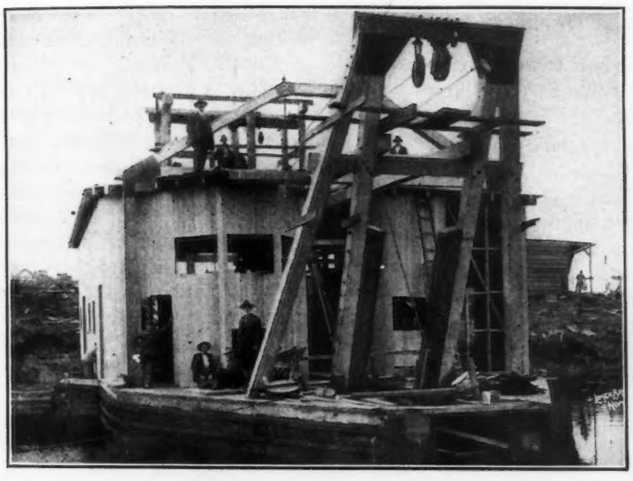
Built by Yuba Construction Company. Three dredges: One for Casa de Paga Mining Company, Nome, 2½-cu.ft., close-connected bucket, to dig 15 ft., belt-conveyer; gasolene driven, two Union engines, total power, 75 h.p.; capacity, 40,000 cu.yd. Two for Yukon Gold Company, Dawson, two steel hulls.

Built by Union Construction Company. Two dredges: One for Julian Gold Mining Company, Osborn creek, Nome, 2¾-cu.ft., open-connected bucket, to dig 14 ft., belt conveyer, revolving screen; gasolene driven, two Standard engines, total power, 80 h.p.; capacity, 30,000 cu.yd. per month. One for York Dredging Company, 2¾-cu.ft., open-connected bucket, to dig 14 ft., no tailing conveyer; gasolene driven, three Union engines, total power, 87 h.p.; designed especially for tin placer mining.[3]

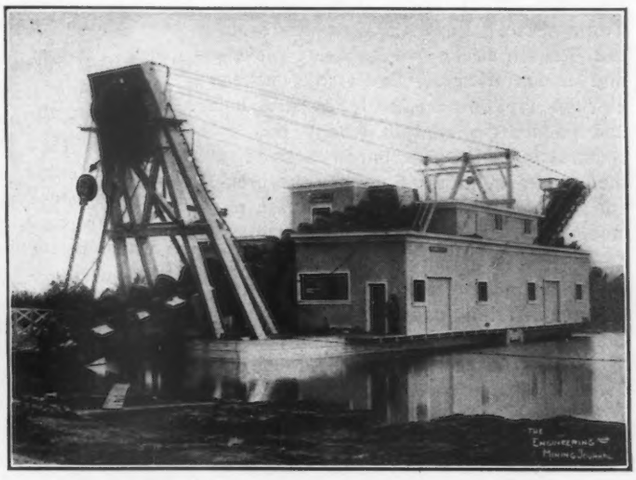
Built by Straub Manufacturing Company. Three dredges: One for Kimball & Saupe, Nome, 2½-cu.ft., open-connected bucket, to dig 16 ft., 60-ft. belt conveyer; gasolene driven, Weston engines, 60 h.p.; capacity, 30,000 cu.yd. per month; shipped in April. Two for Charles Kimball, Nome, same type and dimensions as for Kimball & Saupe; (under construction). These dredges will operate at Galivan, Solomon and Nelson creeks.

Idaho—Built by Yuba Construction Company. Two dredges: One for Boston & Idaho Dredging Company, Idaho City, 15-cu.ft., close-connected bucket, 84-ft. digging ladder to dig 25 ft. below water line, 110-ft. belt conveyer; electric driven, four G. E. motors, total power, 300 h.p.; capacity, 300,000 cu.yd. per month. One for Kirtley Creek Dredging Company, Salmon, 9-cu.ft., close-connected bucket, 84-ft. digging ladder to dig 25 ft. below water line, 110-ft. belt conveyer; electric-driven, four G. E. motors, total power, 250 h.p.; capacity, 150,000 cu.yd. per month.

Montana—Built by Risdon Iron and Locomotive Works. One dredge, for California Dredging Company, Kennedy creek, 5-cu.ft., open-connected bucket,



Risdon Dredge of Plein Company on Otter Creek, Alaska



Baggett No. 1, 7-cu.ft. Open-type Dredge

[1]Eng. and Min. Journ., Oct. 15, 1910, p. 765; Jan. 7, 1911, p. 41; July 8, 1911, p. 65; July 15, 1911, p. 107.

[2]*Bull.* 57, Cal. State Mining Bureau, "Gold Dredging in California."

[3]Eng. and Min. Journ., July 15, 1911, p. 107.

to dig 20 ft. below and stack 20 ft. above water line; steam driven, Risdon water-tube boiler, two compound condensing engines, total power, 125 h.p., wood fuel; capacity, 50,000 cu.yd. per month.

Nevada—Built by Risdon Iron and Locomotive Works. One dredge, for Federal Mining Company, fitting, 5-cu.ft., open-connected bucket, to dig 20 ft. below and stack 20 ft. above water line; gasolene driven, four Doak engines, total power, 196 h.p.; capacity, 60,000 cu.yd. per month; distillate fuel wagon-hauled from Oreana, 14 miles.

Trinity River Field Active

The 10 dredges completed or in course of completion for California fields in the present year include the four 15-cu.ft. boats built by the Yuba Construction Company for installation on the Feather, Yuba and American rivers, but do not include one installed in January, as that was practically completed in 1910. The six others include dredges installed or being installed or under construction in Trinity, Placer, Butte and Calaveras counties. The ten do not include steam shovels and suction dredges. Two of the bucket-elevator type of dredge in construction and installation are not wholly new in constructional features, but in fact add to the equipment of the State for the present year for the reason that they are removed to new fields and reconstructed.

The greatest activity in new gold-dredging fields in the present summer is on Trinity river in Trinity county. The Alta Bert Gold Dredging Company has purchased the dredge formerly operated on Scott river in Siskiyou county at Callahan, and is having it rebuilt by the Union Construction Company for installation at Trinity Center on Trinity river. This is a 7½-cu.ft. dredge designed to dig 25 ft. below the water line; electric driven, equipped with four G. E. motors, total power 250 h.p. The rated capacity is 100,000 cu.yd. per month. The machinery of this dredge is being wagon hauled over the mountain a distance of 28 miles.

Edward L. Smith is building a bucket-elevator dredge on Trinity river, six miles north of Lewiston. A ditch is under construction for generating electric power for operating the dredge. The machinery of the dredge will be wagon hauled from Redding about 30 miles. W. L. Leland, formerly manager of the Three Friends Mining Company on Salmon river, has taken over the Poker Bar property, five miles south of Lewiston on Trinity river, and contemplates installing a dredge this season.

The Beaver Gold Dredging Company (mentioned in the JOURNAL, July 8, as the Weaver) which installed a dredge at Loomis, Placer county, in June, reports satisfactory results. This boat was the last to be completed by the Risdon prior to the succession of the Union Iron Works to the Risdon business. It is a 4-cu.ft., close-connected bucket type, 58-ft. digging ladder, 44-ft. belt conveyer; electric driven; equipped with four G. E. motors having a total power of 160 h.p., and a capacity of 50,000 cu.yd. of gravel per month. It is equipped also with special gold-saving attachment for extremely fine gold.

The L. Gardella dredge under construction at Oroville was the only uncompleted order for the California fields that remained on the Risdon books at the date of taking over the plant by the Union Iron Works in July. This dredge is being built under the supervision of George L. Hurst, engineer formerly with the Risdon and now manager of the dredge department of the Union Iron Works. It is a 5-cu.ft., close-connected bucket type, with 78-ft. digging ladder, 105-ft. belt conveyer; electric driven, equipped with six G. E. motors having a total power of 200 h.p. The yardage capacity is rated at 80,000 per month.

Steam Shovel at Oroville

Favorable reports come from Oroville regarding the installation of the first steam shovel employed for placer mining in that field. This machine was built by L. N. Hearns, of Oroville, and J. C. Martin, of San Francisco. The shovel is operated from a traction-engine platform; the washing machinery is similar to that of the bucket-elevator dredge. No difficulty has been found in keeping the machine ahead of the tailings. If a thorough test shall prove the efficiency of this method of placer mining there will be a large demand for this type of machine for operation in shallow ground.

The Butte Dredging Company, William S. Noyes, Mills building, San Francisco, president, is removing a dredge which was put out of commission at Oroville about a year ago, and is reconstructing it on Calaveras river in Calaveras county, at Jenny Lind. This boat has been operated since 1902, equipped with 3½-cu.ft. buckets. A new bucket line is being installed using 4-cu.ft. buckets; the ladder will be shortened, to dig 26 ft. below the water line, the former digging depth being 36 ft. The dredge will be equipped with G. E. motors with a total of 165 h.p.; the capacity is 50,000 cu.yd. per month. There are about 50 acres of dredgeable ground.

The installation of a suction dredge is reported at Merced Falls in Mariposa county, by the Beeson-List Mining and Investment Company, Metropolitan Bank building, San Francisco. Generally suction dredges have not been favorably considered in gold dredging; but the successful operation of this type of dredge on Clear creek in Shasta county by F. Fulton, of Redding, is reported by the Byron Jackson Iron Works, builder of this dredge.

Petroleum in Argentina

The government commission sent to examine the petroleum wells at Comodoro Rivadavia, Argentina, has made its report, a summary of which has been received from Consul-General R. M. Bartleman at Buenos Aires.

It was found that seven wells were in existence, one of which was commenced in 1903. This was put down with the object of boring for water, and reached a depth of only 165 m., its diameter being too small to admit of its being carried farther. Of the rest, No. 2 (Chubut) was commenced on March 22, 1907, and struck oil on Dec. 13, of the same year at 535 m., the oil coming to the surface for some time, but eventually requiring a pump to raise it. Up to October, 1909, all the oil used experimentally in Buenos Aires, as well as for local purposes, came from this well. At the time of the commission's visit, there were about 2600 cu.m. of oil stored there.

Well No. 3 (Sarmiento) was commenced on May 14, 1908, and completed on Feb. 15, 1909. A depth of 545 m. was reached when a gaseous deposit was entered whence gas was still issuing with great violence and a roar that was audible at a distance of several hundred meters. Well No. 4 (Hidrologia) was commenced Oct. 24, 1908, and terminated Oct. 19, 1909. Two pools of petroleum were passed through, one at 535 m. and the other at 567.7. At times the oil rose to the surface spontaneously, at others it required pumping. The oil is contained in an Australian tank of 20 m. diameter and 2 m. in depth.

Well No. 5 (San Jorge) was put down by contract with a private company. Work was started on Sept. 14, 1909, but on Nov. 10, of the same year, when at a depth of 149 m., work had to be suspended, owing to gas, which at that depth rose in great quantities, having caught fire. At the time of the commission's visit, in January, 1911, it was still burning, although with somewhat diminished intensity. Well No. 6 (Division) commenced on Jan. 16, 1910, reached a depth of 530 m. on Nov. 12 of that year, with indications of petroleum, when an accident rendered the bore useless.

Well No. 7 (Jefe) was commenced on Jan. 1, 1910, and five months later struck oil at 544 m. When the commission was there, the oil was issuing from the well in a thin stream and was being stored in a tank 10 m. above the ground.

As a test of the utility of the oil for fuel, a train weighing 268 tons was sent over a distance of 8⅓ miles, performing the journey in 30 min., the average upward grade being 1.4 in 100. A pressure of 120 lb. was maintained, and 410 kilos of petroleum were consumed. Tested with coal under precisely similar conditions, the consumption was 975 kilograms.

Appraisal of Michigan Mines—IV

By J. R. Finlay*

Valuations of three districts in the Iron River and Crystal Falls regions of the Menominee range and one district on the Marquette range.

*Consulting engineer, 52 William street, New York.

District No. 2, in the Iron River region, is described by Doctor Leith as follows: "The ores are in closely folded, upper Huronian slates. The iron-formation lenses are uniformly steep-dipping. In a large way they have a distinct linear trend, but almost every property shows major buckles and considerable narrowing or widening of the formation. The walls of the orebody may be all slate, all jasper or any combination of the two. The larger orebodies occur in places where the formation has been thickened by folding. The axes of these folds are favorable places for the concentration of ore. They have steep pitches and should have great persistence in depth. . . . . As would be expected under these conditions, individual orebodies have the greatest irregularity in outline, although looked at in a large way, they may conform to the trend of the district. The underground developments are yet shallow, the deepest mine being 690 ft. deep and the average being about 450 ft. Drilling, however, has shown the ore to go down to a depth of 1712 feet."

RECORD OF ACTIVE MINES TO END OF 1910 IN DISTRICT NO. 2

	Tons Shipped	Tons in Sight Above Bottom	Total
Osana (James).,	231,359	520,000	751,359
Chatham.....	181,427	43,000	224,427
Hiawatha.....	614,496	254,993	869,489
Baker.....	84,420	.....	84,420
Dober.....	2,195,146	372 259	2,567,405
Baltic.....	1,340,593	713 000	2,053,593
Fogarty.....	168 936	460,000	628,936
Caspian.....	699,305	3,505,500	4,204,805
Youngs.....	473,784	250.000	723,784
Zimmerman....	37,690	1,000.000	1,037,690
Berkshire.....	135,734	563,000	698,734
Total.....	6,162,890	7,681,752	13,844,642

The exposure of ore in the bottom levels of these mines is approximately 1,100,000 sq.ft. Drilling in this distance shows ore in one hole at 1712 ft. from the surface and in several others at a depth of more than 1500 ft. If we imagine that the ore shown in these mines will approximate an inverted pyramid, the point of which is 1500 ft. below the present bottom, we get a tonnage from these exposures alone of more than 45,000,000. A rough estimate of additional ore shown by drilling is as follows: Davidson ore, 2,000,000 tons; Rogers mine, 2,500,000; N. Y. State Steel, 2,000,000; Michaels, 1,000,000; Tully, 3,500,000; Donahue, 800,000; McGovern, 350,000; Bates, 400,000; Wickwire, 41,000; Erickson, 732,000; total, 13,323,000 tons.

In summary we get the following: Expectation of continuations from bottom levels, 45,000,000 tons; shown by drilling 13,000,000; ore reported in sight in active mines, 7,500,000. We get here a total of approximately 65,000,000 tons as a reasonable estimate. I have no doubt this will be greatly exceeded, for the area of ore in sight in these mines is 2½ times as great as was the average of the old Menominee range, which has accounted for 20,000,000 tons and 1½ times as great as the Gogebic range, which accounts for 75,000,000 tons. All these comparisons would lead one to believe that this district would produce 110,000,000 tons by the time it reaches the state of development in which the other districts are now. It contains one of the greatest ore reserves in Michigan, if not quite the largest.

Davidson, Osana, Wauseca and Other Mines

The Davidson mine is still in the developing stage, having shipped no ore. It reports 2,000,000 tons in sight, which is a reasonable estimate. The Osana mine has a tremendous showing on its bottom level, no less than 159,000 sq.ft. of ore being exposed at a depth of 300 ft. below the rock surface. The orebody is apparently irregular, for the third level shows a cross-section of only 20,625 sq.ft. I have no hesitation in raising the tonnage to be expected from this mine to 2,000,000 tons. The Wauseca mine has shipped no ore, but shows two levels each with a cross-section of approximately 30,000 sq.ft. The lowest level is 400 ft. deep. The company reports 40,000 tons in sight, but I have no hesitation in increasing this amount to 500,000 and adding another 500,000 for good measure, which will bring the total expectation up to 1,000,000 tons. The Nanaimo mine is described as exhausted. The Chatham mine reports 43,000 tons in sight, with an exposure in bottom level of 6000 sq.ft. I count on it for 100,000 tons. The Hiawatha mine reports 254,933 tons in sight with an exposure of 32,000 sq.ft. on the bottom level. It accounts for nearly 900,000 tons with a depth of 575 ft. below the rock surface. Apparently the mine is as good as ever and 1,000,000 tons is a reasonable estimate for its future.

The Chicago mine has shipped no ore, but reports 390,305 tons in sight above the bottom level, which is 500 ft. deep, and shows an area of 13,000 sq.ft. of ore. Six hundred thousand tons is a reasonable estimate for this mine. The Baker is a small property, which contains an orebody that has worked across the line of the neighboring Tully mine to the westward. The Tully shows three important orebodies by drilling. A conservative estimate of these shows up 3,500,000 tons. Nothing was reported in sight. On the Michael property ore is shown in drilling at a depth of 1712 ft. Five holes show an average depth of 210 ft. in ore. There are, at least, 1,000,000 tons indicated here, but on account of its depth it will not be available for a long time. The McGillis, Dober and Isabella mines are all owned by the Oliver Iron Mining Company and account for 2,500,000 tons above a depth of 690 ft. The total area of ore exposed at the bottom of these mines is 47,600 sq.ft., enough to make 4000 tons per vertical foot. It seems safe to add 40 per cent. of the total ore accounted for for future expectations, which will be equal to 1,000,000 tons, in addition to 372,000 tons reported in sight, making about 1,400,000 tons.

Baltic, Fogarty and Caspian Mines

The Baltic and Fogarty mines are operated together. The Baltic accounts for 2,050,000 tons of ore above the 450 level. This means about 4500 tons per vertical foot, which is accounted for by an average cross-section of 54,000 sq.ft. The lowest developed level shows an area of 74,000 sq.ft., enough to make more than 6000 tons per vertical foot. It is perfectly safe to add 1,000,000 tons for additional ore in this property, making a total expectation of 1,700,000 tons. The Fogarty is only 265 ft. deep, of which a considerable part is occupied by surface gravel. At this depth it accounts for a total of 630,000 tons, of which 460,000 tons are in sight. Its bottom level shows an area of 74,800 sq.ft. There is every reason to expect that this mine will prove as productive as the Baltic, which will enable us to add 2,500,000 tons as a reasonable extension, giving it nearly 3,000,000 tons for the future.

The Caspian mine accounts for 4,200,000 tons above the bottom level which is 290 ft. deep, the same being probably more than 100 ft. on the average. This mine has one of the largest orebodies in the whole Lake Superior region, showing on its bottom level a cross-section of 377,000 sq.ft., or about 8½ acres between vertical walls. This is sufficient to make more than 30,000 tons for each vertical

foot. The ore is actually known to occur 100 ft. deeper than the present bottom and immediately north and in its trend drill holes show great quantities of ore at more than 1300 feet depth. I have not the slightest hesitation in counting on this mine for 10,000,000 tons of ore, which is sufficient to maintain an output of 400,000 tons per year for 25 years.

Houlihan, Youngs and Zimmerman

The Houlihan mine is north of the Caspian. One particularly developed level immediately under the sand shows a cross-section of 167,000 sq.ft. It may prove to be as large as the Caspian but I give it a tonnage of only 5,000,000 tons,

DISTRICT NO. 2, IRON COUNTY, MICHIGAN

	Per Ton	Totals
Number of mines and explorations reporting		29
Wages and salaries paid		$4,411,151.48
General expense (not including taxes)	$0.087	$ 352,688.31
Construction, development and explorations	0.895	3,574,038.89
Mining	1.30	5,211,894.90
Total cost at mine	$2.28	9,138,622.10
Rail freights paid	0.40	1,279,487.98
Lake freights paid	0.54	1,609,055.90
Commissions paid	0.067	260,351.01
Total expense	$3.287 (a)	$12,287,516.99
Total tons sold		3,848,325
Total tons shipped		3,820,308
Total tons mined		3,999,457
Receipts from sale of ore		$12,740,286.82
Total operating profit of nine mines		2,044,106.72
Taxes		103,907.11
Taxes to operating profit, per cent		5.5
Royalties paid		844,038.89
Profits to companies (seven mines)		1,395,354.01
Total profits, nine mines (including royalties)		1,952,543.49
Total loss to companies (ten mines)		1,912,320.91
Total tonnage reported in sight		10,169,213.00
Tonnage added by appraiser		31,952,787.00
Total tonnage expected		42,122,000.00
Average yearly value (expected) per ton		3.23
Average cost per ton expected		(a) 2.65
Average profit per ton expected		0.58
Annual tonnage expected (in tons)		1,290,000
Present value of mines		17,042,000.00

(a) F.o.b. Cleveland. Includes unprofitable mines.

this being sufficient to maintain an output of 250,000 tons per year for 20 years. The Youngs mine reports a total of 725,000 tons of ore, of which 250,000 tons are in sight above the 418-ft. level. Part of the ore is pitching northward into the neighboring Fogarty mine. It shows an area in the bottom of 42,000 sq.ft., enough to make 3500 tons per vertical ft. A reasonable extension for such an orebody would be 750,000 tons, bringing the total expectation up to 1,000,000 for the future. The Zimmerman mine shows on one fully developed level an area of 50,000 sq.ft. of ore. Ore is shown in a drill hole 200 ft. below this level. The company counts on 1,000,000 tons, which is a reasonable estimate.

Berkshire and Rogers Mines

The Berkshire mine accounts for about 700,000 tons above the bottom level which is about 300 ft. below the rock surface. It reports 563,000 tons in sight and on its lowest developed level shows a cross-section of 25,000 sq.ft. One million tons is a reasonable expectation for the future of this mine. The Rogers mine is still in the development stage, but shows up a large amount of ore by drilling. I estimate the mine at 2,500,000 tons, but it is not all merchantable, some of it being mixed with manganese.

The total amount of ore apportioned among the Iron River mines is only 42,000,000 tons which I believe, as explained above, is far less than may reasonably be expected. Nevertheless, it is sufficient to maintain the average tonnage of the last five years for 50 years and gives these mines all the present values that can be charged against them at present with propriety. An extension of life beyond 50 years has little or no present value. The demand for ores in this district is moderate, although it will probably increase rapidly from now on. At present the biggest mines in the district are shut down. On account of the patent fact that almost every mine in the district has enough ore to keep up this output at the rate at which it can be marketed for 15 to 20 years, I have not thought it worth while to make any effort to estimate the ore with any great care.

District No. 3, Crystal Falls

Doctor Leith has the following to say about this district: "The ores are in upper Huronian slates, except for the Mansfield mine which is in a band of slates in the Hemlock volcanics, and the Groveland which lies at the base of the upper Huronian series in the Felch schist. As in the Iron River district, the iron formation lenses are steeply tilted, much folded and show great variations in thickness. The walls may be slate or jasper or any combination of the two. The larger orebodies occur in folds in the iron formation, and have thickened the latter. The pitch of these folds has considerable persistence in depth. There are few forties containing iron formation where some ore has not been found." He also says: "In addition to the ore shown in mines, there are 467,000 sq.ft. of ore shown by drilling, which by conservative estimate indicates 1,412,000 tons." The record of the active mines of the district to the end of 1910 is shown in an accompanying table.

These mines are estimated by Doctor Leith to have an average depth of 1023 ft., weighted according to the tonnage extracted. When we come to compare the bottom areas with the ore extracted to this depth, allowing 12 cu.ft. per ton of ore, we find that the present bottom area exceeds that of the average area in the past by nearly 50 per cent., the total tonnage accounted for being 14,000,000 tons, which means that about 12,000 tons has been the average per vertical foot, which would give an average horizontal cross section of 144,000 sq.ft. The actual cross section at the bottom is 207,250 sq.ft. This showing is exceedingly favorable. It is probably perfectly safe to add for future discovery an amount equal to 50 per cent. of that accounted for to date.

Hollister, Mansfield, Bristol and Armenia Mines

The Hollister is an unprofitable mine with an insignificant showing. I make no estimate for it. The same thing may be said of the McDonald. The Mansfield mine is 900 ft. deep. That depth accounts for 1,250,000 tons, which means 14,000 tons per vertical foot and the cross section 16,800 sq.ft. for the average. The deposit, therefore, is losing about 1100 sq.ft. for each 100 ft. in depth, which indicates that it would ter-

RECORD OF MINES IN CRYSTAL FALLS DISTRICT

	Tons Shipped	Tons in Sight above Bottom	Total
Hollister	96,416	.....	96,416
Crystal Falls	1,735,251	42,000	1,777,251
McDonald	7,166	10,000	17,166
Bristol	2,456,100	522,000	2,978,100
Armenia	377,081	50,300	427,381
Great Western	1,952,937	97,300	2,050,237
Tobin	1,630,549	135,300	1,765,849
Dunn	1,658,015	67,000	1,725,015
Michigan	171,719	78,000	249,719
Hemlock	1,705,226	125,000	1,830,226
Mansfield	1,217,355	32,000	1,249,355
Total	13,007,815	1,158,900	14,166,715

minate altogether at a depth of about 1900 ft. and give its probable extension about 500,000 tons. This is equal to a product of 75,000 tons per year for seven years.

The Bristol at a depth of 960 ft. accounts for about 3,000,000 tons, which is equivalent to 3200 tons per vertical foot, indicating an average cross section of 38,000 sq.ft. This is now diminished at the bottom to 26,000, indicating a diminution of 2500 sq.ft. for each 100 ft. additional depth. This indicates that the mine would be bottomed at a depth of 2000 ft., and that the additional tonnage expected might be estimated at about 1,000,000 tons. This in addition to 522,000 tons reported in sight, gives an expectation of approximately 1,500,000 tons. This is sufficient to maintain an output of 250,000 tons per annum for six years. The bottom lever of the Armenia mine is 566 ft. deep and the total accounted for is 427,000 tons. This indicates an average of less than 800 tons per vertical foot, which would be provided for by orebodies having an average cross section of less than 10,000 sq.ft. At the bottom the mine shows an area of 20,500

sq.ft. in ore. It is perfectly safe to count on this mine for 500,000 tons additional ore. This, with the amount reported in sight, is sufficient to maintain a tonnage of 55,000 tons per annum for 10 years.

Great Western and Tobin & Genesee

The Great Western has on the 1157-ft. level an area of 33,000 sq.ft. Above this it accounts for a total of 2,050,000 tons, indicating an average of almost 2000 tons per vertical foot, which would be provided by orebodies having an average cross section of 24,000 sq.ft. The area of the bottom level is 33,000 sq.ft., enough to produce 2750 tons per vertical foot. Ore has actually been reached at the 1267-ft. level. The condition of the property is apparently excellent, and I have no hesitation in adding an expectation of 700,000 tons to the amount reported. This will give 800,000 tons, or enough to maintain an output of 100,000 tons per year for eight years. The Tobin & Genesee mine down to the 1100-ft. level accounts for a tonnage of 1,765,000 tons, equal to 1500 tons per vertical foot, which would be provided by an average cross section of ore of 18,000 sq.ft. The mine shows an area of ore on the bottom level equal to 65,000 sq.ft., sufficient to make 5400 tons per vertical foot. This has actually been demonstrated to continue 125 ft. deeper, which would enable us to estimate 675,000 tons more. This, with the amount reported in sight, namely, 135,000 tons, gives us 810,000 tons. I have no hesitation in figuring that this mine is not more than half worked out, and assuming that it will produce as much in the future as accounted for in the past, 1,765,000 tons, which is sufficient to maintain a tonnage of 200,000 tons per year for nearly nine years.

Crystal Falls, Dunn, Michigan and Hemlock Mines

The Crystal Falls mine is 1063 ft. deep and has produced and at that depth can account for nearly 1,800,000 tons, or approximately 1700 tons per vertical foot, which requires an average cross section of 21,000 sq.ft. The bottom level shows only 17,000 sq.ft., indicating some weakening, but nothing very serious. It is safe to count on this mine producing 500,000 tons more, equal to 50,000 tons per year for 10 years. The Dunn mine is 1500 ft. deep and its orebody has reached the boundary line. I count on it for only about 117,000 tons. The Michigan mine accounts for 250,000 tons at a depth of 600 ft. The output would be produced by an orebody having an average cross section of 5000 sq.ft. At the bottom the mine shows an area of 2880 sq.ft. in ore. It is getting rather small and I do not count on the property producing more than 100,000 tons, which is only 22,000 tons more than is reported in sight.

The Hemlock mine is 935 deep and accounts for 1,830,000 tons. Its lowest developed level shows an area of 22,000 sq.ft., but a still lower level has failed to find the ore. On this account only half a level is allowed below the 935-ft. level, giving 55,000 tons to be added to the reported estimate of 125,000 tons, or a total of 180,000 tons.

Valuations in District No. 3

In all cases I am allowing for increase of mining costs due to increasing depths and the exhaustion of the mines. I am counting on the active mines for an annual product of only 880,000 tons against annual shipments of 1,220,000 tons for the last five years, the expectation being that the falling off in this district will be made up in the Iron River district. Ore found in drill holes is appraised on a basis similar to that of the Iron River district. The total valuation of the district is placed at $6,297,000 and an expected tonnage of 8,064,000 tons. This is equivalent to about $0.75 per ton for the expected ore as against only $0.40 for the Iron River district. This difference in valuation is caused by the difference in the expected life of the properties.

DISTRICT NO. 3

	Per Ton	Totals
Number of mines and explorations reporting		25
Wages and salaries paid		$4,756,223.68
General expenses, taxes not included	0.064	437,288.47
Construction, development and explorations	0.26	1,789,786.65
Mining	0.956	6,565,400.84
Total cost at mine	$1.28	$8,792,475.96
Rail freights paid	0.40	2,374,293.64
Lake freights paid	0.57	3,267,453.98
Commissions paid	0.09	548,504.29
Total expense	2.34 (a)	$14,982,727.87
Total tons sold		6,050,662
Total tons shipped		6,119,177
Total tons mined		6,777,255
Receipts from sale of ore		20,861,190.27
Total operating profit, 10 mines		6,361,951.98
Taxes		131,493.43
Proportion of taxes to operating profits, per cent		2.6
Royalties paid		1,611,190.15
Profits to companies, eight mines		4,846,463.22
Total profits, 10 mines, including royalties		6,238,753.13
Total loss to companies, six mines, not including explorations		710,684.40
Total tonnage reported in sight		1,233,900
Tonnage added by appraiser		6,820,100
Total tonnage expected		8,054,000
Average yearly value (expected) per ton		3.52
Average costs expected per ton f.o.b. Cleveland		2.36
Average profit per ton expected		1.16
Annual tonnage expected		880,000
Present value of mines		6,297,000.00

(a) Includes unprofitable mines.

In regard to the ores of this district Doctor Leith has the following to say: "The ores are partly in tabular bodies parallel to bedding, and partly in more or less well developed pitching folds bottomed by dolomite, talc-schist or slate and are, therefore, elongated in the direction of the pitch. The degree to which the ore is found to follow these pitches varies in different mines and in different parts of the same mine; in general, the pitches being less well developed near the surface than below. The folds unquestionably pitch a long distance below the present bottom levels and there seems to be no reason geologically in the character of the rock and alterations or other features of the bottom levels, why the ore, at least for shallower mines, should not continue on these pitches to as great a distance below the surface as has been reached by the deepest mines of the district, and probably even greater depths." Doctor Leith also states that "the total area of ore on fully developed bottom levels of the Menominee district in which the ore is not known to be cut off by rock or pitching off the property within a limited distance, is 263,435 sq.ft. The average depth of these bottom levels, weighted according to tonnage which has been shipped from the mine, is 1160 ft.

RECORD OF ACTIVE MINES, DISTRICT NO. 4

	Tons Shipped	Tons in Sight above Bottom	Total
Pennsylvania Iron Mining Company	8,845,135	1,437,265	10,282,400
Pewabic	7,317,165	1,233,000	8,550,165
Loretto	1,311,068	1,107,424	2,418,492
Chapin	17,649,477	4,194,679	21,844,156
Aragon	6,077,327	1,085,000	7,162,327
Millie	368,267	20,000	388,267
Total	41,568,439	9,077,368	50,645,807

If the ore shown in bottom levels continues with present areas to the depth of the deepest known ore, this would give 6,320,000 tons as probable ore for the district."

The salient facts which appeal to me are the following: The total amount of ore accounted for above the 1160-ft. level is 50,645,807 tons. This means that the average horizontal area of the orebodies has been in the past approximately 440,000 sq.ft. If we assume that this area is normal for the 580-ft. level and that for the 1160-ft. level the area is only 263,000 sq.ft., we get a diminution of approximately 180,000 sq.ft. in 600 ft. This means that each additional 100 ft. in depth means a diminution of area of 30,000 sq.ft. On this basis we might assume that the ore would vanish at a depth of 1900 ft. This assumption would leave us below the present bottoms approximately 9,000,000 tons.

Penn Iron Mining Company

The Penn Iron Mining Company owns the Cyclope, Norway, East and West Vulcan, Curry and Brier Hill mines, covering a length of three miles along

the Menominee iron-ore formation. It shows 71,245 sq.ft. of ore at an average depth of 930 ft. It accounts for a total of 10,282,000 ft. in a vertical producing depth of 1900 ft. We may assume that at a depth of 450 ft., the average horizontal area of the orebodies would have been 115,000 sq.ft. which is diminished at the present bottom to 71,000. This means a diminution for each 100 ft. of approximately 10,000 sq.ft. of area and points to a probable tonnage yet to be opened up of 2,400,000 tons. Adding this to 1,437,000 tons in sight would give a probable future tonnage of 3,800,000 tons which is enough to last a mine at its average production for 10 years. As a matter of fact these mines have as much in sight now as they ever had, considerable additions in the last two or three years having been made to the tonnage in sight. Our figures mean that an assumption is made that ore will be found in the future equivalent to 23 per cent. of what has been found in the past.

Pewabic, Chapin and Aragon

The Pewabic mine was formerly a high-grade and profitable mine, but it has been bottomed. No estimate whatever is made for continuance. The Chapin mine shows at a depth of 1400 ft. an area of ore amounting to 140,000 sq.ft. Above this level it accounts for 21,844,000 tons. The average cross section assumed at 700 ft. depth was only 160,000 sq.ft. The diminution in volume with depth, therefore, is slow and the prospects for the future are considerable. The developments on the bottom level, however, are not quite so favorable as they look, and I would assume that the mine will be bottomed at the same increase of depth as in the case of the Penn. This will give us about 4,900,000 tons, or again, about 23 per cent. as much as has been discovered in the past. This amount added to what is reported in sight gives 9,000,000 tons for the property, sufficient to maintain an output of 600,000 tons for 15 years. The Aragon mine property shows at a depth of 1100 ft. an area of developed ore of 31,000 sq.ft. It accounts for 7,200,000 tons above this level, which means an average section of 65,000 sq.ft., and a diminution of 6500 ft. for each level. This means that the mine will be bottomed at 500 ft. deeper and gives us an additional tonnage of only 750,000 tons. My calculation, therefore, for this mine is that it can produce this amount in addition to 1,085,000 tons reported in sight, in all 1,800,000 tons, sufficient to maintain an output of 180,000 tons for 10 years.

Loretto and Millie Mines

At a depth of 800 ft., the Loretto mine shows a cross section of 21,200 sq.ft. The average in the past has been over 30,000 tons. It is losing volume, therefore, at a rate of about 2250 sq.ft. for each level, which would bottom the mine at a depth of 1700 ft. and justifies an expected extension of tonnage equal to about 900,000 tons. We can, therefore, give this mine a total expectation of 2,000,000 tons and a life of 20 years at 100,000 tons per year.

The Millie mine only shows 20,000 tons in sight and shipments of 368,000 tons in the past. On account of certain developments in the Chapin mine immediately below it and to the westward, I think it fair to assume that this mine can produce as much ore in the future as it has in the past.

Valuations in District No. 4

It will be noted that this is the least promising in Michigan for the future. It has been shipping annually more than 1,860,000 tons. I am counting on a product for the future of only 1,540,000 tons,

DISTRICT NO. 4, OLD MENOMINEE RANGE

	Per Ton.		Totals
Number of mines and explorations reporting			12
Wages and salaries paid			$9,322,449.20
General expense, not including taxes	$0.097		971,447.21
Construction, development and explorations	0.192		1,915,320.33
Mining	1.128		11,289,470.33
Total cost at mine	$1.417		$14,176,237.87
Rail freights paid	0.40		3,483,420.04
Lake freights paid	0.60		5,369,237.62
Commissions paid	0.07		66,661.27
Total expense	$2.48	(a)	$23,095,556.80
Tons sold			9,391,360
Tons shipped			9,335,812
Tons mined			10,052,564
Receipts from sale of ore			$34,103,131.46
Total operating profit of ten mines			11,040,230.75
Taxes			795,696.22
Proportion of taxes to operating profit, per cent			7.24
Royalties paid			2,395,619.41
Profit to companies, nine mines			7,885,624.86
Total profit mines, including royalties			10,249,066.96
Total loss to companies, two			69,365.83
Total tonnage reported in sight			9,177,348
Tons added by appraiser			9,055,652
Total tons expected			18,233,000
Average yearly value per ton expected			3.46
Average cost per ton expected			(a)2.64
Average profits per ton expected			0.82
Annual tonnage expected			1,540,000
Present value of mines			$11,391,000.00

(a) F.o.b. Cleveland.

expecting as in the case of Crystal Falls that the falling off will be made up in Iron River. The total valuation of these mines is $11,391,000 based on an expected tonnage of 18,233,000 tons.

District No. 5

This district, consisting of the mines of the western Marquette range in Baraga county, has never been profitable to any considerable extent. It contains only four mines which are spasmodically active, namely, the Imperial, belonging to the Cleveland-Cliffs company, and the Ohio, Portland and Beaufort, belonging to the Niagara Iron Mining Company. The Imperial reports, 1,500,000 tons; Ohio, 117,000; Portland, 247,000. There is no occasion to add anything to the estimate of the Imperial. Doctor Leith finds reason to add 200,000 tons of probable ore to the Ohio and Beaufort, bringing the total of this district up to 2,064,000 tons. The only mine in this group that has any pretentions as to value is the Imperial, for which $335,000 is considered a fair valuation.

DISTRICT NO. 5. BARAGA COUNTY, MICHIGAN

	Per Ton	Totals
Number of mines and explorations reporting		3
Wages and salaries paid.		$565,969.48
General expenses, not including taxes	$0.065	48,919.32
Construction, development and explorations	0.214	159,844.44
Mining	1.28	951,722.56
Total cost at mine	$1.56	$1,160,468.32
Rail freights paid	0.35	228,479.12
Lake freights paid	0.61	398,492.21
Commissions paid	0.06	40,147.35
Total expense	$2.58	$1,827,605.00
Tons sold		657,370
Tons shipped		657,370
Tons mined		744,603
Receipts from sale of ore		1,807,495.98
Total operating profits, three mines		45,377.44
Taxes		7,331.05
Proportions of taxes to operating profit, per cent		16.2
Royalties paid		136,601.62
Profits to companies, mines		none
Total profits, three mines, including royalties		38,046.39
Total loss to companies, three mines		98,555.23
Tons reported in sight		1,864,185
Tons added by appraiser		199 815
Total tonnage expected.		2,064,000
Average yearly value per ton, expected		2.98
Average cost per ton expected—f.o.b. Cleveland		2.61
Average profits per ton expected		0.37
Annual tonnage expected		75,000
Present value of mine.		335,000.00

(To be concluded.)

Mineral Paint Production in United States in 1910

Mineral paints as classified by the U. S. Geological Survey, in a report compiled by E. F. Burchard, are divided into three chief groups; first, natural pigments, such as ochre, sienna, hematite, or ground limestone; second, pigments made directly from ores of valuable metals, such as zinc oxide or sublimed white and blue lead; third, chemically manufactured pigments, such as basic carbonate white lead or Venetian red.

The total value of the lead and the zinc white pigments is much greater than that of the natural pigments. Lead and zinc white pigments form the bases for the greater part of all the standard paint manufactured at present. The production of natural pigment in 1910 was 68,623 tons, value $527,795; metallic paint, 29,422 tons, value, $184,869; chemically manufactured, 208,098 tons, value $24,799,092.

Notes on the Cobalt Area

By Willet G. Miller*

The quartz-diabase sill, an intrusion in Keewatin and Huronian formations, has an average thickness of 500 ft. and occupies one-half the productive area. The ore, deposited by both magmatic and meteoric waters, occurs chiefly in calcite veins in the sill and walls.

*Provincial geologist of Ontario, Toronto, Ontario.

In the autumn of 1903 I had the pleasure of sending to the ENGINEERING AND MINING JOURNAL the first paper published on what afterward came to be known as the Cobalt area.[1] Owing to the lateness of the season, there having been a heavy fall of snow three days after my arrival, my examination of the rocks and veins at that time was very brief. The cause of my visit was the receipt in Toronto of a small specimen of niccolite, kupfer-nickel, which the sender thought was copper ore. No mention was made of silver, but niccolite being a somewhat rare and valuable mineral, it was considered that a trip to the place of its discovery was justified. The remarkable assemblage of minerals found in the veins was briefly described in the paper just mentioned, and more fully in later reports in the annual volumes of the Ontario Bureau of Mines.

Rich Ore Found on First Visit

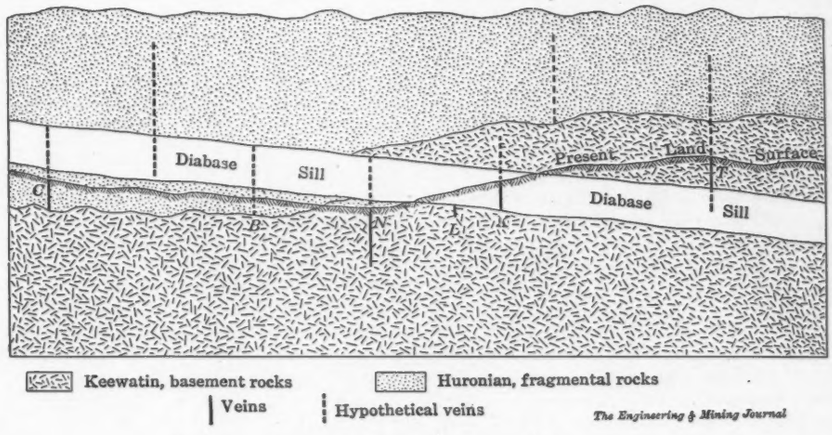
Naturally, only a general knowledge of a small part of the area could be obtained on the first visit, but, in the paper, it was said of one vein that "the ore is very rich, containing values in nickel, cobalt, silver and arsenic, and a comparatively small vein could be worked at a handsome profit." Of another it was said: "It was a vein such as one reads of in textbooks, but which is rarely seen, being so clearly defined and so rich in contents"

Mining in the area during the period, almost eight years, since the paper was written has shown indeed that the veins "could be worked at a handsome profit." It took the mining public, however, nearly two years after the publication of my paper to realize that Ontario did have in Cobalt an important precious-metal area. Cobalt is not only the leading silver-mining area of the world, but it also leads in the production of cobalt and arsenic, and is the third greatest producer of nickel.

During the last three or four years, owing to the widespread developments in virgin mineral areas in Ontario, the members of the geological staff have been able to give comparatively little attention to the Cobalt area. Moreover, there were a number of problems, the solution of which could not be attempted until much work was done in the mines, or in clearing the surface. However, at intervals since last autumn, Cyril W. Knight and I have been reviewing the field in preparation for a fourth edition of the report to the Bureau of Mines. Certain field observations have been made and laboratory results obtained, which, it is thought, may be of interest to the readers of the JOURNAL.

[1]ENG. AND MIN. JOURN., Dec. 10, 1903.

During our first season's work, 1904, we determined that in part of the area, at least, the intrusive quartz diabase occurs as a sill. On our large-scale map, 400 ft. to 1 in., of 1906, we produced a cross-section showing the character of the sill. As mining work has progressed the sinking of shafts in or through the sill at various points and the driving of levels have brought out the character of the sill still more clearly. Our original estimate of its average thickness was between 500 and 600 ft. During a visit last November we were able to confirm this estimate for a part of the area, at least.



VERTICAL CROSS-SECTION OF DIABASE SILL AT COBALT

Diabase Occurs as a Sill

The geology of the productive area, or the relationship of the rocks that have a bearing on the orebodies so far developed, may be summarized as follows: The oldest, or basement rocks, are known as the Keewatin series. They consist essentially of basic volcanic types, now known as greenstones or green schists, together with dike rocks and more or less sedimentary material, probably representing submarine chemical precipitates, and consisting of chert-like material and jaspilite or interbanded silica and iron ore. In the Keewatin there is also a certain quantity of volcanic fragmental material.

The Keewatin series at one time formed the surface of the earth in this region, and was eroded into hills and hollows. On this uneven eroded surface was deposited conglomerate and other fragmental rocks of the Huronian series. The Huronian period represents a great time interval. It is not necessary in this place to discuss the unconformities among the rocks of Huronian age and the intrusions into them, with the exception of the most important quartz diabase of the Cobalt area.

After the Keewatin had been eroded and the Huronian fragmental rocks deposited on it, and after this fragmental material had been consolidated, the intrusion of the diabase still took place. While there are minor irregularities in the sill, on the whole it is remarkably uniform. The accompanying generalized vertical section across the productive area brings out the chief features. The diagram shows that the sill intrudes both the Keewatin and the Huronian, rising gradually from the south or southeast toward the north or northwest, the normal dip being about 17 deg. Most of the upper wall of the sill has been removed by erosion and the colored geological map shows that the surface of the sill now occupies about one-half of the productive Cobalt area.

Sill Forms Clean-cut Contact

The accompanying sketch map shows in a general way the areal distribution of the sill. There are two or three remnants of the upper wall, which occur in the form of "islands" on the diabase. One

of these is on the Nova Scotia property *A*, and another at the Colonial *B*. At the south or southeast of the field the sill rises from beneath the Keewatin rocks, more of the upper wall having been left there. The area *C* is part of the upper wall in which occurs the Temiskaming and Beaver veins. At *D* and *E* the sill has been eroded so as to expose the lower or foot wall. A remarkable feature of the sill is the clean-cut contact it forms, on the whole, with the rocks on both its walls. In the productive area very few dikes are known that can be considered to be connected with the sill.

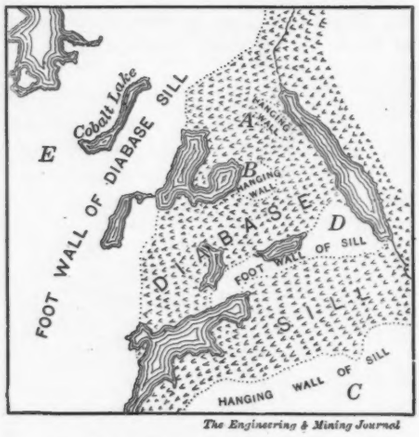
The accompanying generalized vertical section through the productive part of the Cobalt area shows the relation of the diabase sill to the Keewatin and Huronian rocks and to the veins. The eroded surface, above the present land surface, is restored in the section. Types of veins that have been worked together with hypothetical veins, in the eroded surface, are shown. *T* indicates the Temiskaming vein in the wall above the sill, together with its hypothetical extension above and below. *C* represents a large number of veins that are in the Huronian rocks in the lower or foot wall of the sill. The vein marked *N* is intended to represent a type, of which there are few examples, such as vein No. 26 on the Nipissing in the Keewatin below the eroded sill. The vein marked *K* represents a type which has been worked in the diabase sill itself, such as vein No. 3 on the Kerr Lake property.

As the accompanying diagram shows, the relations of the Cobalt-silver veins to the sill are important, and, insofar as I know, these relations can be described as unique. In no other mining area has a sill been proved to have such important relations with orebodies. Of the $60,000,000 worth, or more, of ore that has been produced at Cobalt, all but 10 or 15 per cent. has come from veins in the lower or foot wall of the sill. A certain quantity has come from the veins in the sill itself, as for example, from No. 3 vein on the Kerr Lake property, from one to two veins on the O'Brien, Cobalt Central and others.

While, doubtless, numerous veins occurred in the upper or hanging wall of the sill, these have now nearly all disappeared, owing to the removal of this wall by erosion. The Temiskaming is the most important vein that has been worked in the upper wall of the sill. In fact, this mine and the Beaver are the only two of importance that have been developed in this wall. The Temiskaming is the deepest productive vein in the area, the workings having reached a depth of 575 ft. Deposition of ores in economic quantities does not appear to have taken place at such a distance beneath the sill as above it. This is only what would be expected, as ore-bearing solutions would work upward above the sill more readily than they would work downward beneath it.

On the cooling and shrinking of the diabase, cracks or fissures, now occupied by the veins, were produced. These fissures were formed not only in the diabase itself, but also in the wall rock, lying both above and below the sill. More fissures were formed in the Huronian wall rock than in the diabase or Keewatin series. Some writers have assumed that the veins now remaining represent the narrower, lower parts of veins that extended upward a considerable distance before erosion took plac.

There is, however, no evidence that the upper parts of the original veins were materially wider than the veins now being worked, or that the veins at one time reached the surface. This is shown by the discovery, in underground workings, of "blind" veins, or those which do not reach the present surface. Moreover, certain veins lie below the uneroded part of the diabase sill, and there



SKETCH MAP, SHOWING DIABASE SILL AT COBALT EXPOSED BY EROSION OF HANGING WALL

is little or no evidence of the extension upward of these veins into the sill itself. On the other hand, certain veins outcrop in the diabase and have been followed downward through the sill and into the underlying Huronian and Keewatin. The rocks underlying the uneroded part of the sill offer a field for future prospecting.

SOURCE OF THE ORES

The parts played by magmatic and meteoric, or surface-derived waters, in the deposition of ores afford a fruitful theme for discussion. I will not, however, undertake to try to trace in detail the history of deposition of the ores at Cobalt and the respective parts played by these waters. Recent writers have offered impressive reasons tending to show that there are no truly magmatic waters, or in other words, that magmas at their point of origin are practically anhydrous, and that water is absorbed during the upward movement of intrusives.

Doubtless the diabase sill at Cobalt on intruding the Keewatin and Huronian rocks carried water along with it. On the cooling of the sill and the formation of fissures the water worked through the sill itself and into the fissures in the upper wall and for a certain distance into the lower or foot wall of the sill.

It also seems to me that meteoric waters or those working downward from the surface played an important part in the deposition of certain of the ores at least. Briefly it may be said that the large mass of diabase represented by the sill in the course of time was subjected to digestive action by the water accompanying its intrusion combined with water working downward from the surface. Doubtless certain minerals now in the veins may have been dissolved out of the wall rocks.

Since the cobalt-nickel ores in the Cobalt veins are known to be for the most part older than those of silver, it may be that the water accompanying the intrusion of the sill played a more important part in their deposition and that meteoric waters were largely instrumental in the deposition of the silver. Secondary enrichment, or the solution of ores in the upper parts of the veins and the carrying downward of the dissolved materials and their deposition at lower levels, no doubt has taken place. But I doubt whether secondary enrichment has played such an important part at Cobalt as certain authors believe it has.

FAULTING

Faults, generally with small displacement, and joints are very numerous in rocks in which the Cobalt ores are found. Few drifts are run that have not one smooth wall, indicating a fault or a joint, for at least part of their course. The faults are of various ages. Some of those in the Keewatin are doubtless pre-Huronian in age. Others were formed at the time of the Lorrain granite intrusion; while later faulting took place at the time of the intrusion of the diabase sill and later still when the fissures now occupied by the ores were opened. After the filling of the veins there was again faulting in pre-Cambrian times. A few veins occupy fault planes while others have been disturbed by more recent faulting. There are even minor faults that were formed after the Glacial period.

The most important fault, concerning which there is detailed information, is that which runs approximately parallel to the main La Rose vein, following the valley occupied by the railway at this point. The throw is at least 300 or 400 ft. The small area of diabase opposite the mine is a part of the sill which has been brought down at this point, the west side of the railway being the down-throw side. This fault is of the reverse type, its plane

dipping about 70 deg. to the eastward. The fault can be followed through the workings in Cobalt lake and is clear and distinct in the McKinley-Darragh mine at the southwest end of the lake. The main workings of the last mentioned mine are on the down-throw side of the fault.

Two Fault Systems

In my reports on the district I have drawn attention to the lines of weakness in the region. These form two systems, northwest-southeast and northeast-southwest. The former system of lines is the more striking on the maps, being the direction followed by the Ottawa and Montreal rivers and by other important water courses. The northeast-southwest system is represented by the line along which lie Cobalt and other small lakes and other water courses. The fault at Cobalt lake explains the origin of the line of depression in which it lies. Doubtless the northwest-southeast system also owes its origin to faulting.

In the case of Temiskaming, an expansion of the Ottawa river, the subject of faulting has an important economic bearing. The lake here forms the boundary between the provinces of Ontario and Quebec. Through the interest aroused by Cobalt on the Ontario side, much prospecting has been done on the opposite side of the lake in Quebec, but without the discovery of important silver deposits. In fact, the diabase has been found to be almost absent on the east side of the lake with the exception of some exposures to the east of the narrows in the lake.

The abrupt ending of the outcrops of diabase on the western shore of Temiskaming appears to be due to faulting, the Ontario shore apparently being on the down-throw side, thus protecting to a considerable extent the diabase and its associated veins from erosion. After faulting took place what is now the Quebec side of the fault stood at a higher level than the opposite side. It now has been eroded down to the level of the Ontario side, and the diabase and any veins that may have existed have been removed. From a map it will be seen that the comparatively little diabase on the Quebec side is probably on the west side of the down-throw of the fault, the course of the lake changing at the narrows. A northeast-southwest fault may also have some bearing on the preservation of this Quebec diabase.

Calcite Characteristic Gangue

While a few of the veins contain remarkably little veinstone or gangue, calcite is a characteristic mineral. In most of the veins this mineral, or what was at first taken to be it, occurs in tints of white, gray and pink. It has been noted that the white or gray veinstone is characteristically present with the richer or silver-bearing ore; the pink variety is also present in most veins but appears to have been deposited earlier than the white variety, as it is frequently cut through by veinlets of the latter. The pink is present frequently in the nonproductive parts of veins, or in veins or parts of veins which contain cobalt and nickel minerals with little silver.

In my reports on the area I have expressed the belief that most of the silver has been deposited in the veins after most of the cobalt and nickel arsenides. The veins give evidence of disturbance resulting in fracturing after the deposition of the latter minerals. Into these fractures the silver has been deposited. Of course, it is not meant to imply that no silver was deposited in the earlier generation or that no cobalt-nickel arsenides were deposited in the latter.

Our first analyses of the veinstone were of samples of the white variety which was found to be remarkably pure calcium carbonate. Analyses that we have had made recently of samples of the pink variety from various mines show that it differs greatly in composition from the white. The pink is a manganese-holding calcium-magnesium carbonate as the accompanying table of analyses shows.

ANALYSES OF VEINSTONE

	1	2	3	4
Calcium carbonate	55.05	59.65	62.68	77.80
Magnesium carbonate	36.63	30.98	32.89	15.67
Manganese carbonate	0.68	0.25	0.46	0.88
Insoluble	7.64	9.12	3.97	5.65

Sample 1 was from Temiskaming mine, third level; 2 and 3 from O'Brien mine, and 4 from Hargrave mine. Analyses by N. L. Turner.

With the Silver Islet ores on Lake Superior there was a pink, manganese-holding carbonate. Rhodochrosite is said to have occurred there. Quartz occurs sparingly in most of the veins at Cobalt.

Fluorite and Barite

Fluorite and barite are characteristic of most veins which carry ores similar to those of Cobalt. Thus at Silver Islet and in other veins in the Port Arthur district they were typical veinstones. At Annaberg, Saxony, these minerals are also important veinstones. However, in the numerous veins that have been worked at Cobalt barite and fluorite have not been observed. It seems to me that their absence may perhaps be accounted for by the fact that the intrusive diabase in rising from a depth followed a course approaching the horizontal for a considerable distance. Barite and fluorite were probably segregated and deposited in the rocks surrounding the sill beyond the limits of the present producing area.

In one or two veins in the Elk Lake area, containing similar minerals to those of Cobalt, barite is found. Elk lake lies about 35 miles to the northwest of Cobalt. In the southeastern part of the Porcupine gold area, 90 miles northwest of Cobalt, a couple of cobalt-silver veins occur which contain considerable barite.

Mercury Recently Discovered

In the paper published in the Journal in 1903 it was said: "The only deposit in which quicksilver has been found in Ontario is that of Silver Islet" where the ores are similar to those of Cobalt. Knowing that mercury had been reported to occur in the Silver Islet ore, I had a few tests made of ore from Cobalt for the presence of the metal, but without detecting it. More recently, however, it has been discovered by the staff of the Nipissing mine. While the mode of occurrence is not known, it is said that the ordinary ore shipped contains from four to five pounds per ton, and that the "metallics," or the purer metal which resists crushing in the sampling works, frequently contains 20 lb. or even 40 per ton.

Methods which have been employed in refining these ores are not adapted to save the mercury, but the process now being employed by the Nipissing Company at Cobalt is well suited to treat mercury-holding ore. It is a combination of amalgamation and cyanidation. The mercury in the ore should at least serve to make up any losses of mercury that may take place in amalgamation. Whether the mercury occurs with one or with more than one mineral in the ore it is impossible to say. Since it is present in larger quantity in the metallics than in the ore as a whole, it would seem that it may exist as amalgam. Tetrahedrite is of quite common occurrence in the Cobalt veins, and varieties of this mineral are mercury-holding in some districts. Samples of dyscrasite-holding ore that I recently had tested gave off mercury readily when heated in a glass tube.

Mercury has been found with rich silver ores in other parts of the world. For instance, in the well known veins at Kongsberg in Norway native silver was found to be alloyed often with mercury (up to 1 per cent.) and antimony (up to 0.6 per cent.). The native silver at Cobalt is known to carry antimony and probably it and dyscrasite are the source of the mercury as well.

Relative Ages of the Rocks

The age classification of the rocks which we have hitherto adopted for the Cobalt area, while it has served economic purposes, has been employed provisionally in so far as the fragmental rocks are concerned. We have placed all the rocks that are older than the Lorrain granite in the Keewatin and those that are younger than the granite, and of pre-Cambrian time, in the Huronian. The Keewatin itself is a great complex of basic and acid volcanic rocks together with dikes and chemical and mechanical sediment. The origin of some of the last mentioned sediment, or rocks of fragmental character, is difficult to determine. Much work re-

mains to be done before anything like a complete knowledge of the Keewatin, which occupies such vast areas in the Canadian pre-Cambrian regions, is acquired.

The conglomerate, impure quartzite and slate-like graywacke, which are of such great economic importance at Cobalt, we have classed provisionally as Lower Huronian, the series being the oldest of the Huronian observed in association with the productive cobalt-silver deposits. We have classified these rocks provisionally for the reason that there were indications that there might be an older series of conglomerate in the district; boulders apparently of conglomerate were found in the conglomerate of the Cobalt series[2]. It was also known that on Lake Temiskaming and elsewhere there was a series of conglomerate and associated rocks which dipped at high angles, in distinction from that at Cobalt which lies in an almost horizontal position. In addition to its steep dip, the former conglomerate gives evidence of disturbance by the occurrence in it of many dikes.

Age of Conglomerate

However, in our earlier field work we were not able to find contacts or other structural features which would show the relation of the disturbed conglomerate to that of the productive Cobalt area. Hence we considered the conglomerate to be of one age, assuming that outside of the productive area the conglomerate had been more disturbed than within it. At Kirk lake, which lies just outside of the productive area, in our early field work, at a time when owing to the bush-covered surface the relations of the rocks were more difficult to determine than they are now that the timber has been removed and many trenches run through the soil, we found the granite intruding a series of fragmental rocks which we considered to be volcanic fragmental in origin. This contact is now much better exposed, and, while it is difficult to decide whether some of the fragmental material here is of volcanic origin or not, there is a fragmental series with well rounded pebbles which is intruded by the granite. This forms a series of conglomerate which is older than the Lorrain granite.

The contact also throws light on the age of the lamprophyre dikes which we have described as cutting the Keewatin but not the conglomerate and associated fragmental rocks in which the rich cobalt-silver veins occur. The lamprophyre at Kirk lake cuts the conglomerate and is in turn cut by dikes of fine-grained granite, apophyses from the Lorrain massive. Between Kirk lake and Cross lake the surface, where not covered by loose deposits of glacial and recent age, is occupied by a part of the diabase sill. At the southwest corner of Cross lake, to the north of the diabase, conglomerate with lamprophyre dikes, similar to that at Kirk lake, is exposed.

The areal distribution of the rocks at this end of Cross lake has been carefully studied by Carl Reinhardt, who is in charge of properties in that vicinity. The striking exposure of jasper conglomerate on the shore of the lake, mentioned in our earlier reports, has been enlarged by stripping, which exposed a lamprophyre dike that cuts the conglomerate. The conglomerate of this part of the lake is underlain by rocks of the Keewatin series containing the jasper-iron formation and chert-like material. There appear to be two graywackes, one of the same age as the conglomerate and another apparently contemporaneous with the iron formation although unrecognized unconformities may exist. These graywackes look much alike. At Kerr lake, westward from Cross lake, the Keewatin series is overlain unconformably by the conglomerate of the Cobalt series.

Distinctive Names Essential

While an erosion unconformity has not been observed between the conglomerate

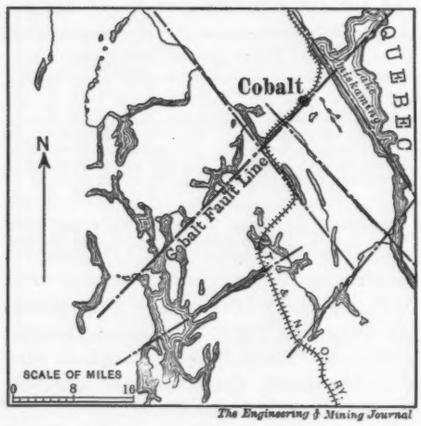


Diagram Showing the Lines of Weakness in the Cobalt and Surrounding Areas

of the Kirk Lake-Cross Lake area and that of the Cobalt series proper, the fact that lamprophyre intrudes the former and not the latter and is intruded in turn by the Lorrain granite makes it advisable in a complete description of the district to distinguish the conglomerates by different names. Local names for series of rocks are objectionable for various reasons, and thus far we have preferred to speak of the conglomerate in which the cobalt-silver deposits occur as Lower Huronian, indicating thereby that it is the lower member of the Cobalt series. It seems necessary, however, to employ names in describing the rocks lying not only in the productive Cobalt area itself but for those lying in the Nipissing district as a whole, which will be distinctive, although being local names they will not be so intelligible as, for instance, are Lower, Middle and Upper Huronian.

For the fragmental series, in which the cobalt-silver veins characteristically occur, we propose to employ the name Cobalt Series, which we have heretofore used in a general way. For the older, more disturbed conglomerate series, which outcrops at Kirk and Cross lakes and in greater volume on Lake Temiskaming, outcrops also being known a considerable distance south of Cobalt and 90 miles to the northwest at Porcupine, the name Temiskaming will be used. The granite intrusive into the Temiskaming series but not into the Cobalt series will be called the Lorrain Granite, a name under which it is already known. The quartz diabase of the sill at Cobalt, which is of such great economic importance and is so widespread, not only in that vicinity but throughout a large territory in the district of Nipissing, will be called the Nipissing Diabase. This will serve to distinguish it from diabases of other ages that occur in the region.

The following shows the relative ages of the above mentioned pre-Cambrian series, in descending order from the youngest to the oldest:

Nipissing Diabase—Quartz diabase of Cobalt sill, etc.—

(Intrusive contact)

Cobalt Series—Lower Huronian conglomerate, etc., of the cobalt-silver deposits.—

(Unconformity, erosion)

Lorrain Granite

(Intrusive contact)

Temiskaming Series—Conglomerate, etc. of Kirk, Cross and Temiskaming lakes, etc.—

(Unconformity, erosion)

Keewatin

In the third edition of his valuable treatise, "Lehre von den Erzlagerstätten," pp. 218-221, Dr. R. Beck has some remarks on the origin of the ores at Cobalt with which I cannot agree. Doctor Beck's notes are based on observations made by Dr. O. Stützer during a brief visit to Cobalt.

Beck's Notes on Origin of Ores

The following sentences in quotation marks have been translated from Doctor Beck's book: "It has been further observed that the veins at Cobalt generally carry silver in the diabase and in the Huronian conglomerate, but in the deeper-lying Keewatin they contain generally only cobalt and nickel ores.

"Miller concluded from this that the native silver had opportunity for depositing as a consequence of a later opening up of the veins, which did not affect the tougher Keewatin rocks. O. Stützer, on the other hand, points to the intimate intergrowth of silver and smaltite which does not harmonize with this view. For example, in the Trethewey vein silver is found in dendritic forms right in the center of the smaltite. The change in the ore seemed rather to be based on

[2]Fourteenth Report, Ontario Bureau of Mines, Part II, p. 40, and on annotated map.

physical-chemical influences of the country rock. Stützer states that many veins in passing from the Huronian conglomerate to the Huronian slate lose their silver content, which they regain on reëntering the conglomerate. He inclined to the view that a different electrical conductivity was favorable or unfavorable to the precipitation of the silver."

From observations continued over a number of years, I have no doubt that the cobalt-nickel ores belong essentially to an older generation than the silver ores. It can be seen in numerous silver-bearing veins that there has been a fracturing or opening of veins carrying smaltite and niccolite before the deposition of silver ore. It would hardly be expected that the solutions carrying cobalt-nickel ores would entirely cease their circulation before those carrying silver began to penetrate the openings and fissures now occupied by the veins. Observations on the order of deposition of the cobalt-nickel minerals themselves tend to confirm this. While the normal order of deposition appears to have been smaltite after niccolite, the former mineral surrounding grains or nuclei of the latter, still veinlets of niccolite have been observed to penetrate smaltite.

Distribution of Veins

Insofar as my observations go, "physical-chemical influences of the country rock" cannot account for the presence of rich silver ore in certain veins and its absence in others. About 80 per cent. of the ore mined has come from the veins in the Huronian fragmental rocks. Veins in these rocks are more numerous, simply because these rocks fractured more readily than the Keewatin or the intrusive quartz diabase; and the secondary minor disturbance, which fractured or produced openings in many of the veins, had less effect on those in the Keewatin than on those in the Huronian. The fact that certain veins are of less economic importance in the slate-like facies of the Huronian than in the conglomerate means nothing more than that the fracturing is more distinct in the latter than in the former. In the conglomerate the fissures are usually larger and better defined than in the slate-like facies. A vein in coming from the former into the latter usually splits up into stringers, some of which, instead of running vertically downward, run off horizontally between the bedding planes. The greatest width of milling ore in the Cobalt area occurs in the slates where films and small leaves of native silver are found in minute fissures between the beds of slate and in minute vertical cracks over a width of 10 ft. or more. Silver in economic quantities is certainly not absent in the slate-like facies of the Huronian.

I also believe that "different electrical conductivity of the country rock" has had nothing to do with the deposition of the ores, important mines being worked in all three of the series—Huronian fragmental, Keewatin and diabase sill.

Sill and Ores Genetically Connected

In a discussion of the origin of the ores I have emphasized the genetic connection between the diabase sill and the ores. Van Hise has likewise discussed the subject. The following quotation from Beck shows that he holds different views concerning the origin: "We do not consider that the further supposition of Van Hise, that the metallic content of the veins is genetically connected with the laccolitic diabase intrusions, is correct. It seems probable that at Cobalt, as everywhere in the Hartz mountains, the veins of the silver-cobalt formation are connected with younger granite masses, which are to be expected at greater depth."

No one, it is believed, who has made a systematic study of the ores at Cobalt itself, or of similar ores in the surrounding region, covering about 3000 square miles, will agree with Doctor Beck that younger granites, and not the diabase, were responsible for the ores. The unique granite dike on the University mine property at Cobalt, shown on our large scale geological map, has probably led Doctor Stützer, to whom Doctor Beck refers, to conclude that acid intrusions of this kind had a bearing on the genesis of the ores. This dike, however, in our original examination of it was considered to be a differentiation product of the diabase magma like certain aplite dikes in the diabase in the Elk Lake area and elsewhere. Analyses of specimens of the University mine dike, and of the narrow aplite dikes of the Montreal River area by N. L. Bowen, confirmed this belief.[3] As is well known, diabase frequently passes into more acid types, having the chemical composition of granite.

Intrusions of granite, as Doctor Beck says, are considered to be genetically connected with the silver-cobalt ores of the Hartz mountains. In speaking of the veins of Joachimsthal, he says (Weed's translation page 287), "The veins traverse dikes of quartz porphyry, and in their turn are cut across by dikes of basalt and the *wacke* veins. However, since these *wackes* sometimes contain some interspersed argentite (earthy silver glance) where they cross the ore veins, it is inferred that at the time of the eruption of the younger volcanic rocks, the vein formation had not yet been quite completed." It would be just as reasonable to assert that these younger volcanic rocks are genetically connected with these ores as to say that at Cobalt "the veins of the silver-cobalt formation are connected with younger granite masses, which are to be expected down below."

The norite of the Sudbury nickel deposits and the diabase of the Cobalt silver-cobalt veins are eruptives having certain characteristics in common. Both, while being basic rocks, contain free silica, quartz, as an essential constituent. Coleman, Barlow and other writers have shown that the Sudbury norite magma has produced striking differentiation products now represented by granophyres or granites, just as the diabase of the Cobalt and other surrounding areas has. Since everyone, practically, who has studied the Sudbury deposits, admits that the norite is genetically connected with the nickel and other ores, it is not remarkable that at Cobalt (only 90 miles distant) diabase, a rock of similar composition to the norite, should be genetically connected with the cobalt-silver deposits, especially as cobalt and nickel are closely related metals. Notwithstanding the origin of ores in the Hartz or elsewhere, it is not necessary to look for younger granites or other rocks down below to account for the ore at Cobalt.

[3] *Journ.* Can. Min. Inst., Vol. XII, 1909.

Prussian Mineral Production

The official figures for the mineral production of Prussia for the year 1910, which have just been issued, show the following: Coal, 200,415,903 metric tons; petroleum, 110,996; iron ore, 4,823,605; copper ore, 903,834; zinc ore, 714,855; pyrites, 202,648; lead ore, 133,954; manganese ore, 80,324; arsenic ore, 520,317; nickel ore, 10,053 metric tons.

The production of mineral salts was as follows: Rock salt, 500,977 metric tons; kainit, 3,119,400 metric tons; other potassium salts, 2,584,564 metric tons. These were produced by mining. There was also a considerable production from salt solutions, this being as follows: Sodium chloride, 351,697 metric tons; potassium chloride, 510,560 metric tons; magnesium chloride, 23,397; sodium sulphate, 71,676; potassium sulphate, 46,394; magnesium-potassium sulphate, 19,121; magnesium sulphate, 32,771; other sulphates, including alum, 9858 metric tons.

It is interesting to note that the value of the various carbon and hydrocarbon products was 1,561,366,741 marks; that of the various ores, 125,633,166 marks; while that of the various mineral salts mined as such was 64,649,613 marks, of which the potash salts were worth 62,419,989 marks. The various potash salts which were recovered from solution amounted to approximately 55,000,000 marks.

Simple Test for Tungsten Ores

A simple qualitative test for tungsten in ores can be made by boiling a little finely ground ore with 10c.c. strong sulphuric acid in a test tube. After being cooled the liquid assumes a deep blue color. It is unnecessary (*Met. and Chem. Eng.*, Aug., 1911) to add tin or any other reducing agent.

The Trolhättan Electric Smeltery

By J. B. Van Brussel*

Working results at the Trolhättan, Sweden, electric smeltery are satisfactory; production about 23 tons of pig iron per day; cost of plant about $11.70 per yearly ton of production.

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The electric iron-smelting plant constructed at Trolhättan by the Swedish Association of Iron Masters was started several months ago, and is now in full working order and the first results have proved eminently successful. The furnace building occupies a floor space of 80 ft. by 51 ft. 8 in., the hight from the ground floor to the furnace top being 44 ft. 3 in. and the total hight to the eaves 70 ft. A broad-gage railway track is constructed from the Trolhättan station to the plant. Two side tracks are laid to the site, one being for the transport of fuel to the fuel-storage shed, and the other for transport of other materials to, and of iron from, the works. The fuel-storage shed is designed for a storage capacity of about 7000 cu.m., which approximately corresponds to six months' consumption. The fuel is charcoal, which is conveyed from the railway cars into the shed by two band conveyers of cold-rolled steel. From the storage house the charcoal is elevated to the furnace top in suspended baskets running on a wire rope. The ore is taken in barrows from the ore heaps to the crusher plant, from which it is elevated to the furnace top in a truck running on an inclined track.

Furnace Construction

With regard to the electric installation, the high-tension apparatus and transformers are placed in a separate section of the building. From the two transformers for the furnace the low-tension conductors enter the furnace building proper through two openings in the wall. In the construction of the furnace, two separate portions are to be distinguished, the shaft and crucible or hearth. The shaft consists of a shell of steel plates, 0.4 in. thick around the stack and ½ in. around the bosh. At the top it is riveted to an octagonal supporting ring of channel iron by which the shaft is supported. The walls on both sides of the furnace are built out at four places as supporting pillars. At a hight of 30 ft. from the ground level they support two built-up beams 4 ft. 4 in. high with a free length of 35 ft. 4 in. Around the furnace these are joined to form an octagon on which rests the channel-iron ring mentioned above.

The shaft is lined with Höganäs firebrick to a thickness of 1 ft. 2 in. in the bosh and 1 ft. 6 in. in the stack. At the top of the shaft is a Tholander charging bell and cone, which is raised or lowered by means of a capstan driven by a 2½-h.p. reversible three-phase motor. The cone is connected to the capstan by a 0.4-in. wire rope provided with a hook, which is removed between the charges so as to be out of the way of the coal baskets which pass close to the center line of the furnace.

The crucible rests on a concrete foundation. Like the shaft it is surrounded by a sheet-iron shell, ½ in. thick. At the top this shell is reinforced by a 0.6x8-in. iron band to take up the pressure of the arched roof. The lining of the hearth is of Höganäs and Stabbarp firebrick next to the shell and foundation, with an inner lining of magnesite brick, while the dish-shaped bottom is formed of a mixture of magnesite and pitch rammed in so as to extend for some distance up along the walls. The roof is constructed of Ifö firebrick; the hearth and shaft are joined by means of a sand seal. The four electrodes project through the roof in a slanting position at an angle of 65 deg. to the horizontal. Each electrode is built up of four carbons of square section, making a total section 2 ft. 2 in. square. At the openings in the roof the electrodes are surrounded by cooling jackets of copper provided at the top with asbestos packing to prevent the leakage of gas. The contacts for conducting the current to the electrodes are at the upper ends and wedged between the electrodes and a holder of cast steel. The holder, in its turn, is supported on a frame movable up and down between two guides on each side of the electrode.

Trolhattan Furnace

Part of the Furnace Gases are Circulated

In this process provision is made for the circulation of the gases in such manner that gas is drawn by means of a fan from the gas outlets and blown into the crucible. Consequently, the quantity of gas passing any given section of the shaft can be varied within certain limits by varying the speed of the fan.

This circulation of gas has two special objects: (a) The gas blown into the crucible is there heated and gives off its heat to the charge in the shaft in passing up through it. Through this heating of the charge in the shaft a reduction of the ore by CO is facilitated, so that this gas is utilized to some extent for the process. (b) The second purpose of the circulation is to cool the roof of the crucible and thus protect it from overheating. This cooling action of the gas is due in part to the absorption of heat in raising the temperature of the gas, and in part to the decomposition of CO_2 and H_2O in the gas in contact with the incandescent carbon in the crucible.

From two gas outlets at the top of the shell, the gas passes into a large dust-collecting chamber, and from this chamber the circulating gas is drawn by the fan which blows it into a circular pipe surrounding the furnace. From this pipe it finally enters the furnace through four tuyeres. The volume of gas corresponding to the gas formed escapes from the dust-collecting chamber through a pipe extending above the roof of the house and burns there. In the original construction, four gas pipes led into the cooling jackets around the electrodes. These pipes were, however, soon disconnected, as it was found that the electrodes were attacked too strongly by the carbonic acid in the gas blown through them.

Gas Cooling of the Electrodes Unsuccessful

The original intention of the introduction of the gas around the electrodes was to cool them as well as the surrounding brickwork. The fan was designed to deliver, at a speed of 2500 r.p.m. and a consumption of 8 h.p., a volume of 70 cu.m. of gas per min. against a back pressure of 1 ft. 1 in. of water, the temperature of the gas being assumed at 200

deg. C. and its composition at equal volumes of CO and CO_2. The iron is conducted in trenches of a total length of about 20 ft. to a small swinging spout in the foundry. There are 6 beds arranged in two rows of 3 beds each containing 28 pigs. Each section is provided with its distributing feeder, to which the iron is conducted through the swinging spout. For tapping the slag the crucible is provided with a slag hole from which the slag is tapped into slag buggies of ordinary construction. During a large part of the time, however, the charge has been high in iron and the quantity of slag correspondingly small. Under these conditions, separate tappings of slag have not been made, but the slag which has accompanied the iron has been skimmed off and allowed to flow into a sand trench.

Two capstans are placed on the top platform, one for elevating the ore truck from the crusher and the second for bringing up the charcoal baskets. Both are driven by the same motor of 16 h.p. In one corner of the top floor is a water tank of 14 cu.m. capacity. Water is pumped from a canal close to the works. The pumping plant contains two centrifugal pumps, each having a capacity of 350 gal. per minute.

Principles of Construction

The fundamental principles of the construction of this furnace are the following: (1) As all known materials become good conductors at a high temperature, the construction must be such that the current does not pass away through the lining during the working. (2) The construction must be such that the charge itself protects the lining from destruction through radiation from the electric arc or through conduction; otherwise, it would be necessary to employ water cooling with consequent waste of energy. (3) The charge must not press harder against the electrodes than is necessary for the formation of an arc. If this condition is not fulfilled the tension becomes unduly low, the electrodes and conductors assume inordinately large dimensions, and the working becomes irregular. In the electric working the carbon charged with the ore cannot burn, and for obtaining a product of uniform quality it is necessary to have a hearth of sufficiently large dimensions to serve as a mixer. Otherwise the irregularities which inevitably occur in charging will influence the carbon contents, etc., of the product. In order to fulfil these conditions the hearth is constructed in the shape of a comparatively large crucible covered by an arched roof.

Another important feature in a furnace of this kind is the regulating of the energy supply. As a reduction furnace must necessarily work with a considerable gas pressure, the usual method, consisting of raising or lowering the electrodes, cannot be conveniently employed, as it would be too difficult to keep the packings tight around the electrodes. A system has been elaborated by which the electrodes are generally only adjusted in accordance with their wear, but all other regulating is accomplished by varying the tension of the current supply. This is done by cutting out windings on the high-tension side of the transformers, and the arrangements are such that the different phases can work simultaneously with different tensions; for instance, 80 volts on one phase and 70 volts on the other, etc. This method of regulating the current has greatly facilitated the working.

Working Results

The starting point of the calculations was a manufacture of 7500 tons of pig iron per year of 11 working months, i.e., about 23 tons per 24 hours. Apart from the small quantity of coke used for starting the furnace, charcoal has been used exclusively for the reduction. The charges

Trolhattan, Sweden, Electric Iron Smeltery

Furnace Shaft and Conductors

Furnace Top

Gas-circulation Fan

are made by volume, but all of the charcoal is weighed and analysis made every day. According to these analyses the average charcoal has been: Moisture, 14.58 per cent.; volatile combustible, 10.26 per cent.; ash, 3.06 per cent.; carbon, 72.10 per cent.; both moisture and ash have occasionally been unduly high, the latter owing to stones and gravel mixed with the charcoal. The ore and limestone are broken up in a powerful Blake crusher; as the crusher delivered a coarser product than desired, a plate was fitted under one of the jaws so that the ore, which at first had been of egg size, was reduced to nut size.

The electric energy for the plant is obtained from the government power station at Trolhättan, and is three-phase alternating current of 25 cycles and 10,000-volt tension. The furnace transformers are two in number, each of 1100 k.v.a. with a guaranteed overload capacity of 1375 k.v.a. under one hour. A third 1100-k.v.a. transformer so constructed as to serve as reserve for both main transformers is provided. To make operations possible with only one transformer, the high-voltage side has been provided with a switch by which any one of the transformers can be used alone.

In the estimate, the total cost of the work was estimated at about $60,000; the accounts show, however, that the actual cost has amounted to about $88,000. As regards maintenance, it may be said that the necessity of repairing the crucible has been slight. During a period of nearly five months' continuous working only 18 hours have been required for repairs, which must be regarded as an eminently satisfactory result. It is also satisfactory to note that the hight and other dimensions of the shaft have, in the main, proved correct for normal conditions of fuel and ore. The experience with this furnace further appears to indicate that with this size four electrodes is a minimum number. It would probably be better to use six electrodes with three-phase current. The working results have shown that this would distribute the heat more uniformly, and the risk of disturbances of the work on account of defects in the transformers would be reduced. Losses through cooling water would in this case probably be increased, but this would undoubtedly be more than counterbalanced by the advantages gained.

The world's production of quicksilver in 1910, according to statistics of the U. S. Geological Survey, was 3399 metric tons of 2204.6 lb. each, against 3304 tons in 1909, 3296 tons in 1908, and 3307 tons in 1907. Spain is the largest producer, furnishing nearly a third of the total world's supply from the famous Almaden mines. The United States, Austria-Hungary, and Italy have in turn held second place, this country ranking third in 1910.

Gasolene Mine Locomotive

By Jesse Simmons*

Operators in the Black Hills district of South Dakota are awaiting with much interest the results of the installation of a gasolene mine locomotive to be used for haulage at the property of the Trojan Mining Company, at Portland. The ore is gathered from side tracks at a number of workings, that farthest from the mill, and furnishing the majority of the supply, being the Decorah, 4500 ft. distant. The maximum grade of the entire trackage is 3 per cent. and the gage 18 in. This gage might be considered rather narrow for heavy service, but all of the mine tracks were of this gage prior to the purchase of the locomotive, and it was not considered expedient to change. At the Decorah the ore cars are hoisted out of an inclined tunnel by an electric-driven hoist and switched to a sidetrack to be later picked up by the locomotive. At another point the ore measures known in this camp as the "upper contact" are to be worked by dropping the mine cars down an incline to a switch convenient to the main tracks, and thence hauled to the mill by the locomotive. At the present time about half of the haulage distance is underground, and the balance will be shedded over for protection from winter snows.

Gasolene Mine Locomotive for Trojan Mine, Black Hills

The locomotive was manufactured by the Milwaukee Locomotive Manufacturing Company, of Milwaukee, Wis., and is of seven-tons weight and 35 h.p. The cylinders are four in number, six-inch stroke by six-inch diameter, developing the above power at 800 r.p.m. The weight of the engine is 925 lb. Crank shaft and connecting rods are of forged steel, with five long bearings for the crank shaft. The engine-oiling system is what is known as the automatic force feed, and the splash system is used in the crank case. The engine is equipped with Kingston carbureter, governor, geared circulating pump, breech-block spark plugs, Remy standard magneto and a dry-cell battery for starting.

*Deadwood, S. D.

The main frame is of steel, rectangular in shape, sides and top are cast-iron plates, subframe of openhearth steel. The engine is inclosed within a housing of removable steel-wire screens, attached to steel frames. The drive wheels are 21 in. in diameter, wheel base 40 in., length over all 11 ft., width 42 in., hight 48 in. The working drawbar pull is 2340 lb. at low speed. The transmission is of the inclosed type, having two speeds—four and eight miles per hour forward or backward. The gears run in oil, and are changed by means of jaw clutches with all gears in mesh, in contradistinction to the sliding-gear practice so popular in automobile construction. There is a lever for engaging the different gears by means of the jaw clutches. The reversing mechanism consists of a coupling connection permitting a sliding shaft to move backward and forward sufficiently to engage and to release two cone clutches alternately. These clutches consist of two tar fiber cones which are attached to the sliding shaft, coöperating with steel cups with pinions and sleeve sections. The movement of the sliding shaft is controlled by a hand wheel connected to an arm pivoted to the shaft.

Wheels are of openhearth cast steel, set on the axles by a pressure of 30 tons, the axles being of special steel, standard construction. The drive-wheel boxes are of openhearth steel, conforming to standard railway practice. Spiral steel tempered springs are used throughout. The chain has case-hardened rollers.

Bronze bearings are used in all instances, with lubrication by means of marine-type compression grease cups, while the axle journals have oil boxes. Among the incidentals might be mentioned the radiators which are of copper and brass, of substantial design; a hand brake, operating on all drive wheels simultaneously; hand or foot operated gong; a sander and a chemical tank for absorbing all disagreeable odors. The locomotive handles 15 one-ton ore cars per trip, and will easily supply the 300-ton mill.

Wellington Pit Accident, England

Special Correspondence

Inspector Redmayne reports that the explosion of May, 1910, which killed 136 persons, was initiated by ignition of firedamp and carried on by coal dust. The ventilating system was poor.

On May 11, 1910, an explosion and fire occurred in the workings of the Wellington pit of the Whitehaven colliery, whereby 136 persons lost their lives. The official report presented to the Home Secretary by R. A. S. Redmayne, chief inspector of mines, contains some striking passages. Referring to Mr. Redmayne's report, the Whitehaven colliery is situated on the outskirts of the town of Whitehaven, in Cumberland, and close to the sea shore. The colliery comprises three mines, viz., the Wellington, William and Ladysmith pits. The Wellington, which has been operated for nearly 70 years, is worked by three shafts, namely, the Wellington (downcast), which is 9 ft. in diameter and sunk 894 ft. to the six-quarter seam; the pump shaft, also a downcast, is 8½ ft. in diameter, and sunk to a like depth; the upcast pit, 12 ft. in diameter, but sunk only to a little below the main band seam. There is also an entrance into the mine known as the Bearmouth drift, a highly inclined road, which passes by the Duke pit and comes to the surface near the Coach road. A certain amount of fresh air goes down it into the mine and some men travel by it. Coal is hoisted at the Wellington shaft, which is fairly dry.

Workings Under the Sea

The Wellington pit passes through the main band seam at a depth of 611 ft. 10 in. from the surface; but the present winding eye (inset from which coals are wound) is at a depth of 761 ft. 7 in. from the surface, and the seam is reached by means of a stone drift. From the pumping shaft water is pumped to the surface from the six-quarter level. The Duke pit is an old shaft, which was cut off from the workings some time ago, but at the surface there is a fan. Both fan and shaft are available for use should anything go wrong with the upcast shaft or fan. The main band seam is a thick one, there being no less than 10 ft. of coal, or a total hight of 11 ft. 4¾ inches.

The seam dips under the sea at the moderate inclination of about one in 20, so that at the inbye extremity of the main-intake road, which has a westerly direction, 3¾ miles from the bottom of the Wellington pit, it is 1386 ft. from the sea bed and practically the whole of the workings are under the sea. The furthest-in working place in the mine, viz., the extremity of the sixth north district, is slightly over four miles from the shaft bottom. Mr. Redmayne does not know of any mine in any part of the world, the workings of which extend for so great a distance from the shafts.

The system of working is that known as the "bord and pillar," which consists in first driving roads rectangularly to form pillars, and afterward working or "robbing" the pillars, allowing the roof to fall as the coal is worked out. The pillars varied in size from 25x30 yd. to 30x40 yd. The bords were 6 yd. wide, and the pillars were usually worked off by lifts 5 yd. in width driven to the rise.

At the time of the explosion the ventilation was produced by a fan of the Walker indestructible type, placed on the surface and driven by a compound engine in good condition. The fan, which is 24 ft. in diameter and 8 ft. wide at the vanes, exhausts from the upcast shaft, being driven at a speed of 34 r.p.m., inducing a current of 50,000 to 55,000 cu.ft. at the bottom of the downcast shaft. The total quantity of air exhausted by the fan is between 78,000 and 85,000 cu.ft., made up of the Wellington-pit air, part of the air from the William pit and surface leakage. The fan was working at 6.7 in. of water gage, and was capable of producing 150,000 to 200,000 cu.ft. per min. The high water gage was attributed to the heavy frictional resistance, due to the great length of airway and the leakage underground.

Large Leakage of Air

The volume of air in the various currents was as follows: As measured at bottom of the shaft, 50,000 cu.ft. per min.; in the "Infidel" drift, 39,000; at Benk's turn, 29,000; at the third north district crossing, 13,000 and at the inbye side of third north way-end, 15,000. The air can be accounted for, therefore, as follows: Leakage between bottom of the downcast shaft and the "Infidel" drift, 11,000; used to ventilate the Saltom district, 1800; leakage between the Infidel drift and Benk's turn, 8200; used to ventilate the third north district, 13,000; used to ventilate the fifth and sixth north districts, 15,000 and loss by leakage, probably between Benk's turn and the third north way end, 1000.

This shows that between the shaft and the third north way-end there was a leakage of over 41 per cent. When the great distance which the air current has to travel from the points of measurement made in respect to the third and sixth north splits is considered, it will be realized that a further leakage must have taken place, and that only a small quantity of the total volume of air reached the face of the workings, where the firedamp is chiefly generated and the men are mostly engaged. There is in all coal mines a large leakage of air from the intake through separation doors, stoppings, and air crossings in the passage of the air current from the shaft to the various district splits, but the leakage in this case was excessive.

Poor Ventilation System

Mr. Redmayne expresses the opinion that, taking into consideration the gassy character of the mine, the scheme of ventilation was not well chosen. The management was evidently aware that the ventilation was unsatisfactory, for it had of late years been engaged in making the main road air tight by building side walls for some distance on each side of it, but further inbye only on the side next the return. It had completed this work with the exception of about 200 yd. and had just commenced on a large scheme of reorganization of the ventilation which would have been completed within a month of the date of the accident. This scheme consisted in erecting a Sirocco fan in the return at the point named the "fan site" and driving the same by means of a wire rope carried from Saltom, where the electric driving plant was stationed. The effect of this fan would have been to augment greatly the ventilation, and in its introduction Mr. Redmayne considers the management was well advised.

As to the cause of the explosion he thinks there can be no doubt that it was initiated by the ignition of firedamp in the neighborhood of the goaf. This gas may have been driven out of the goaf with great force, due to heavy falls of stone, and it may have fired at a defective lamp. Or the explosion may have been caused by matches left in the workings.

The evidence afforded by lamps is nearly always of a doubtful nature on account of the violence to which those in the area of force are subjected. It may be mentioned that the explosive force did not go far into the return airways, a fact which may be accounted for by the comparative absence of coal dust in these roads. Further, the humidity of the air would render such dust as there might be innocuous. Mr. Redmayne holds the opinion that the explosion was initiated by the ignition of firedamp, and was carried on by means of coal dust.

No precautions seem to have been taken in case of the "weighting" of the goaf, a feature which presages a fall of roof and, with such a roof as that in question, would be an incident fraught with great danger to those in the neighborhood of the goaf. In similar circumstances the men should be cautioned to withdraw in the event of pronounced weighting. Mr. Redmayne suggests that it is desirable that those working in the neighborhood of similar goaves (i.e. goaves where the roof consists of a thick bed of hard rock which does not readily fall or bend) should be provided with electric lamps in place of oil safety lamps. The almost total failure of the rescue operations constitutes a convincing argument in favor of the provision at every colliery of trained rescue brigades and means of summoning them at short notice.

Few Precautions Against Dust

The precautions against the accumulation of coal dust were of a haphazard and unsystematic character. No doubt the fact that shots were not fired in getting the coal gave the management a sense of security in this respect, but had the haulage road of the third north been systematically cleared of dust and damped with water the explosive blast would not have traversed this road to the extent it did and so would not have reached the "friction gear." In this connection Mr. Redmayne quotes the report he jointly prepared with R. D. Bain on the explosion at West Stanley colliery: "We are anxious to emphasize the impression made upon us in investigating this and other explosions that unless the grave danger which exists at many collieries owing to the presence of coal dust is attacked with much greater earnestness in the future than it has been in the past, disasters of a similar character will occur from time to time."

The provision of water mains on main-haulage roads is advocated. Had water been available in the mine, the inspector considers that the conflagration could have been extinguished and the probability is that the explosive force at the friction gear would have broken the pipes and prevented the initiation of the fire.

The ventilation of the working face was inadequate for the needs of the mine, in view of the gassy nature of the coal. This inadequacy was largely due to the excessive leakage from the air current in its course from the shaft to the working face, and not to any want of ventilating power at the surface, any increase of which would not have materially affected the face ventilation. This inadequacy cannot be wholly attributed to the existing management, the leakage being due to errors on the part of a former management.

The British Mines Act requires that the quantity of air in the respective splits or currents shall be measured and recorded at least once a month, but it does not indicate the place of measurement. There may be, as at the Wellington pit, a great distance between the place of measurement and the face, consequently the volume of the air current as measured at the "split" may give no indication of the quantity arriving at the workings, owing to the loss by leakage. The adequacy of the ventilation of a district can, to a great extent, be determined from the quantity and condition of the air returned from the face.

As to what bearing the inadequacy of the ventilation had on the occurrence of the explosion is not easy to say. With a goaf in which the roof is composed of a bed of strong rock and the waste likely to remain open for a long period, gas is bound to collect therein unless the waste is swept by a sufficient ventilating current. When the roof falls, the gas is driven out with great force upon those working in the neighborhood.

Mr. Redmayne says that, considering the dangerous nature of mining and the liability to ignitions of gas and coal dust, and in view of the Mines Act prohibiting anyone having matches in his possession in a mine in which safety lamps are used, it should be made compulsory on the part of the management to search all persons entering the mine, for matches. In Scotland, the manager is empowered by law to search persons "when and as often as he may think proper," but in Cumberland the search is to be made only "if there is any ground for suspicion." In Yorkshire "men may be searched for tobacco, pipes and matches, but the person making such search shall first be examined by two of the workmen of the mine." In North and East Lancashire "if there be any ground for suspicion he shall be subject to be personally searched." In no case is compulsory searching enacted.

Alabama Coal Production

Alabama's coal production in 1910 was 16,091,979 tons, valued at $20,209,577, an increase of 2,388,529 tons over 1909. This unusually large tonnage (the largest previous production being 14,250,454 tons in 1907) was due primarily to the strike in Illinois and other Western States, and secondarily to low water in the Ohio and Kanawha rivers which reduced shipments from Pennsylvania and West Virginia to Mississippi River points.

The coal mines of Alabama were practically free from strikes in 1910, there being only 25 men idle from that cause during the year. The coal-mining industry of Alabama was marred during 1910 by two bad disasters which together cost the lives of 131 men. The first occurred on April 20 at the Mulga mine and cost 40 lives; the second was at the Palos mine on May 5 and cost 91 lives. According to the report of the chief mine inspector of the State, the total number of fatal accidents in 1910 was 238 against 129 in 1909.

The number of men employed in the coal mines of Alabama in 1910 was 22,210, who worked an average of 249 days, chiefly of 10 hours. The average production per man was 725 tons for the year and 2.91 tons for each working day.

Iowa Coal Production

The total production of coal in Iowa in 1910 was 7,928,120 tons, valued at $13,903,913, an increase of 170,358 tons in quantity and of $1,110,285 in value over the figures for the preceding year, according to E. W. Parker, statistician of the U. S. Geological Survey.

The benefit derived by Iowa coal operators from the strike in the Illinois field was principally in eliminating the competition of Illinois coal from the comparatively local markets, which are the natural territory of the Iowa mines. The idleness in Illinois reacted upon the Iowa production more in the way of higher prices than by any marked increase in production. Apparently the only reason assignable for the comparatively small increase is that the mines were operated to their full capacity with the available supply of labor.

That there was no exodus from the Illinois mines to those of Iowa is shown by the fact that fewer men were employed in the Iowa mines in 1910 than in 1909. There were some strikes, but they were not as protracted as in Illinois, and the total time lost was only about 10 per cent. of the time worked. The general strike which began on April 1 lasted in Iowa about six weeks, whereas in Illinois it lasted practically six months. Coal was mined in 22 counties of Iowa in 1909 and 1910.

The Iowa coal mines gave employment in 1910 to 16,666 men, who worked an average of 218 days. Of these men 9209 were on strike during the year, the average period of idleness being 44 days. The average production per man was 476 tons for the year. Most of the mines of the State are operated eight hours per day.

Iowa probably ranks second among the States west of the Mississippi river in order of priority as a coal producer. Iowa's total coal production to the close of 1910 has amounted to nearly 164,500,000 tons, which, including the estimated loss of half a ton for every ton recovered, represents an exhaustion of approximately 247,000,000 tons. The original supply of coal in Iowa, as estimated by M. R. Campbell, of the U. S. Geological Survey, was 29,160,000,000 tons, from which it appears that at the close of 1910 a little over 99 per cent. of the original supply, was still available.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

T. Lane Carter, of Chicago, is examining mines in the northern part of Oregon.

M. F. Perry, of the Creston Colorado Company, left New York, Sept. 17, on his return to La Colorada, Sonora, Mexico.

Charles M. Schwab, president of the Bethlehem Steel Corporation, has sailed for Europe, to be gone about two months.

John Reddington, superintendent of the Provincial mine, Cobalt, will take charge of the Swastika mine, Swastika, Ontario.

L. S. Ropes, of Helena, Mont., is engaged in designing, equipping and laying out a new coal mine in the Havre district, in the northern part of Montana.

Louis Reyersbach and Hugh F. Marriott, directors of the Central Mining and Investment Corporation, have returned to London after an extended tour of Canada.

Stanley N. Graham has resigned as superintendent of the Canada Sulphur Ore Company, Queensboro, Ont., to accept an appointment with the Geological Survey of Canada.

Harley E. Hooper has resigned his position as assistant manager of the Progress Mines of New Zealand, Ltd., at Reefton, N. Z., and is for the present at Adelaide, South Australia.

George H. Hall, secretary of the Cleveland Rock Drill Company, left Cleveland, Ohio, early this month, for a 30 days' business trip to Denver, Cripple Creek and Salt Lake City.

Prof. J. W. Richards, of Lehigh University, who has just returned from Norway where he spent some time in investigating electrical conditions more particularly in regard to electric smelting, is in Toronto.

Albert Broden, of the Reading Iron Company, and Robert E. Brooke, of the E. & G. Brooke Iron Company, Birdsboro, Penn., have returned from Swedish Lapland, where they inspected the large magnetite iron-ore deposits.

Milton O. Knauss, formerly superintendent of the Macungie plant of the Empire Steel and Iron Company, and lately assistant to H. R. Hall, superintendenet of the Crane works, Catasauqua, Penn., has been appointed superintendent of Topton furnace of the Empire company, to succeed James McKeever, resigned.

John M. Boutwell, consulting geologist for Phelps, Dodge & Co., has finished a detailed survey of the mining geology of the property of the Moctezuma Copper Company at Pilares de Nacozari, Sonora, Mexico. After completing work at Bisbee, Ariz., he will shortly proceed to Santa Barbara, Cal., where he will be engaged for a few weeks in the preparation of reports.

George S. Rice returned to Pittsburg last week from his tour of inspection of European coal mines. He has been appointed on a commission with Mr. Miller, of the Geological Survey of Canada, and Doctor Hayes, of the U. S. Geological Survey, to investigate the alleged undermining of Turtle hill, near Frank, Alberta, and to decide whether mining operations there should be limited.

Governor E. O'Neal, of Alabama, has appointed Milton H. Fies, Edward C. Coxe, C. P. Ludwig, Jones G. Moore, Joseph V. Allen, of Birmingham; Priestly Toulmin, of Lehigh; Morris Bush, of Woodward; Fred Derricott, of Hargrove; William Stewart, of Blocton, and Charles H. Nesbitt, chief mine inspector, delegates to the session of the American Mining Congress, to be held in Chicago.

OBITUARY

George B. Irvin, of Fairchance, Penn., who was identified with the H. C. Frick Coke Company in various capacities for 25 years, and for two years secretary of the Coke Producers' Association at Connellsville, Penn., died suddenly on Sept. 14, at Pittsburg. Mr. Irvin was born in 1860, at Greensburg, and had always lived in the coke country.

Th. Oblaski died suddenly at Atlin, B. C., Sept. 7, of heart failure. He had been connected with several mining enterprises in the Yukon and in the Atlin district of British Columbia. For some time past he had been engineer and manager of La Société Miniére de la Colombie Britannique, and had made a success of the hydraulic methods he introduced at the company's property on Boulder creek. He was 50 years old, and was a brother of J. Obalski, for many years head of the Mining Department of Quebec.

Kenneth L. Fahnestock died in Denver, Colo., Sept. 8, aged 51. He was born at Gettysburg, Penn., educated in Philadelphia, and passed his early business life in that city. About 1881 he removed to Colorado and engaged in mining, at first at Poncho Springs and afterward in the Gunnison country. About 1892 he settled at Leadville and became largely interested in mines there. For some years past he had been connected with the Ibex Mining Company, of Leadville, which controls among other properties the famous Little Jonny workings. To him fell much of the active management of the concern, for he directed exclusively the leasing of its holdings. He leaves a widow and three children. He was recently chosen chairman of the Colorado Conservation Commission.

John Souther, who was said to have been the oldest iron manufacturer of the country, died at Newton, Mass., Sept. 12, aged 97. He was born in South Boston in 1816 and served his apprenticeship in a foundry in South Boston. He founded the Globe Locomotive Works in South Boston in 1821, conducting it until his retirement in 1881. In 1849, Mr. Souther sent around Cape Horn the first locomotive and steam shovel for the railroad from Sacramento to Fulton, 35 miles long. About 18 years later, when the Union Pacific and Central Pacific tracks were completed, Mr. Souther sent two locomotives around Cape Horn and they took the first train through from the Pacific. During the Civil War, the Government had the exclusive use of Mr. Souther's works and the machinery for 16 war vessels was built at the plant. The machinery from this works was also used in the construction work upon the Suez canal and the French Panama canal. Mr. Souther was the inventor of numerous machines and devices, the best known of which was the steam-shovel dredge.

John Eaton, president of the Oil Well Supply Company, Pittsburg, died suddenly at Atlantic City, N. J., Sept. 16. Death was due to heart failure. Mr. Eaton was born in 1840, at Esopus, Ulster county, N. Y. He began his business career in New York City in the manufacture and sale of goods used in oil drilling and is regarded by many as the father of the oil-well supply business, having started as a clerk in the office of Joseph Nason & Co., of New York. In 1867, he started in business himself and two years later became associated with E. H. Cole, forming the partnership of Eaton, Cole & Burnham. In 1878 the Oil Well Supply Company was organized by several rival companies. These included Eaton, Cole & Burnham. Mr. Eaton had been associated with the company since it was organized and was president of the company for a number of years. He was also formerly president of the Continental Tube Company, which later became part of the National Tube Company. Mr. Eaton was prominently identified with the Chamber of Commerce of Pittsburg for 20 years and in 1904 was elected president of that organization.

SOCIETIES and TECHNICAL SCHOOLS

Indiana Bituminous Coal Operators' Association—Insurance against strike losses for the Indiana operators was decided on in the quarterly meeting of the association at Terre Haute. The meeting was attended by 50 or more operators from all parts of the mining districts of Indiana. The report of a previously appointed committee to perfect a plan of insurance against losses by strikes was submitted and discussed. The general proposition was accepted and changes suggested in the details were adopted. The State association will be called on to ratify the plan.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Sept. 19—Attorney General Webb, of California, has declared in an opinion handed to the State mineralogist that mining claims prior to patent, in California, are subject to assessment for taxes, and bases his opinion on the political code and State Supreme Court rulings. With all due deference to the legal wisdom of the attorney general, the political code of the State makes no such provision, so far as your correspondent is able to see. As to any decisions of the Supreme Court in the premises, they need not here be discussed. Numerous inquiries have been received by State mineralogist Aubury from holders of unpatented mining claims asking advice on the subject, and he has asked the attorney general to advise him, which he has done in an opinion which holds that there is a vast difference between land as a part of the public domain and "the possessory rights to land," and proceeds with the assumption that the code supports his contention. Section 3617 (Chap. II) of the Political Code, to which the attorney general refers, gives this definition of property: "Moneys, credits, bonds, stocks, dues, franchises, and all other matters and things, real, personal and mixed, capable of private ownership;" and defines real estate as "(1) possession of, claim to, ownership of, or right to the possession of land," and "(2) all mines, minerals, and quarries in and under the land," etc. In respect to the assessment of property the opinion refers to Section 3634 (Chap. III) of the Political Code, which contains in substance this provision bearing on the matter: "That when the assessor has not received from the owner of the land the statement required (by Sec. 3629) and the Superior Court finds that the land has not been surveyed, etc., the court shall direct the county surveyor to make the survey; and that the expense of such survey shall be a lien upon the land, and added to the taxes and collected as other taxes are collected. Section 3765 (Chap. VII), to which the attorney general makes no reference, provides for the collection of taxes in that, "unless the taxes delinquent, together with the costs and percentage, are paid, the real property on which such taxes are a lien will be sold at public auction."

If Attorney General Webb can explain the process by which the State of California, or any of its political subdivisions, can sell at public auction a piece or parcel of the public domain, occupied as a mining claim prior to the issuance of patent, the title of which is still in the Federal Government, there would be no need for further discussion of the opinion. But the opinion says that it is not the land, but the "possessory rights to the land" that are assessable; the locator of a mining claim, however, has no such rights; he has merely the right to earn such possessory rights. The land he so holds by virtue of mining location is not capable of private ownership, such capability following only the completion of the essential $500 worth of work entitling him to application for patent; he has no right to the possession of the land, and claims not possession, but occupancy, quite a distinct difference. As to the assessment of all mines, minerals and quarries in and under the land, it is plain that the code refers to such land as is held in private ownership, and further that only such land can be held for the nonpayment of taxes. Again recurring to the attorney general's assumption that it is not the land, but the "possessory rights" that are assessable, let it be explained how the State is going to secure the payment of such tax.

Denver

Sept. 19—The Denver Chamber of Commerce "Grubstake" idea as carried out, has been a novel and interesting experiment; at the end of the first season, the summing up appears so far to be satisfactory. The report of the committee says that 65 prospectors were sent out in 34 different parties with the result that pay ore was found in five different regions. There are 22 parties still in the field and $3500 of the fund raised are still in the treasury. The La Plata and Gunnison regions show the best results. These finds of ore have to be thoroughly exploited, of course, in order to determine their real value, and a separate company is to be formed for this purpose; they have been examined and reported upon as worthy the expenditure of capital, and as a stimulus has thus been given to prospecting again, much has been accomplished.

Pueblo and Cañon City are seeking an injunction in the Fremont county district court to compel the Twin Lakes Placers Company, of Granite, to cease from further polluting the waters of the Arkansas river by its operations on Cache creek. It is estimated by experts that enough dirt has been washed into the river to form a deposit 100 ft. wide and 32 ft. thick from Granite to Cañon City; data have been collected for four years.

Leadville is in a prosperous condition and shows a steady increase of shipments. The work accomplished during the month of August may be summarized as follows: The completion of sinking the Silver Spoon shaft, Prospect mountain; the opening of ore in the fault south of the old Moyer shaft, California gulch; the completion of the surface buildings at the Colonel Sellers; the finding of zinc-carbonate ore on Rock hill and in Iowa gulch; the opening of a true fissure vein at the 500-ft. level of the Hellena, Iowa gulch; the extension of the zinc belt to north Fryer hill; the cutting of three important veins in the Siwatch tunnel and one in the Sugar Loaf Consolidated tunnel; the sinking of the Great Eastern shaft near Lake Isabel, and the finding of gold ore in new territory northeast of the Best Friend toward the base of Mosquito range.

Butte

Sept. 20—While the development of the placer gold on the West Gallatin river, Gallatin county, during the last season has not been extensive, it has determined the presence of considerable areas of auriferous gravel containing "flax and pumpkin seed" gold of exceptional fineness. Indications are that with the advent of practical placer miners in the field, a profitable industry will be developed. Railroad facilities are making this highly mineralized district more accessible, and attention is being directed to the copper and lead ores, as well as the coalfields, which have been known for many years.

By the agreement of the underwriters of the new bond issue for the Boston & Corbin properties at Corbin, to take all of the $200,000 bonds not subscribed for by the shareholders, and 10 per cent. of the amount of their subscriptions having already been deposited as evidence of good faith, practically unanimous consent has been obtained of the stockholders to permit the modification. On Oct. 18 the next instalment of $175 per $500 bond, less the 10 per cent. mentioned above, is due; on Feb. 18, $150 is payable, and on June 18 the remaining $150 falls due. At present the company has no funds and is borrowing $10,000 on its notes, and while the purpose of the bond issue is primarily for the building of a concentrator, the managers intend to be absolutely sure of their ground before

authorizing this expenditure, though the engineer, James W. Neill, and the general manager, have for a long time urged the building of the plant, stating that the reserves of ore now opened fully warrant it, and that an operating profit would be made as soon as the mill was ready to receive the ore. President Amster has announced his intention of making a visit to the property soon to make a thorough investigation of the conditions there.

Salt Lake City

Sept. 21—The foundations for the lead furnaces and the stack for the new lead plant at the International's smeltery at Tooele have been completed. The construction work has been delayed longer than anticipated, but some of the steel has arrived and the lead furnaces will be completed without further delay. The question of a sintering process has been under consideration for some time, and the management has decided on the Dwight-Lloyd process. It is not certain that the furnaces will be ready to blow in by the end of the year as expected, but unless somthing unforeseen happens, they should be ready soon after that time. A large stock of lead ore is on hand, and more is steadily coming in.

The Utah Copper Company during August produced 9,010,669 lb. as compared to 7,555,407 lb. for July. For the first quarter, ended March 31, the output was 12,296,709 lb.; for the second quarter, ended June 30, the production was 24,469,812 lb., an average for the first half of this year of 7,627,753 lb. per month, compared to an average of a little over 7,137,000 lb. per month for 1910. The increase in the production is due to the fact that the greater part of the remodeling and construction work at the two concentrating plants has been completed, nearly doubling the capacity. It is understood that no effort was made by the company to make a large output, in conformity with the curtailment program, and that little more than dividends have been made. The output for the third quarter of the year will probably show an increase.

Through the decision of the Secretary of the Interior, affirming the decision of the General Land Office of Jan. 31, 1911, the right to S.2-T.15 S., in the Salt Lake district, has been denied the state. The secretary is of the opinion that the land was known to be chiefly valuable for coal at the date of the approval of the survey, and therefore did not pass to the state under the State School Grant.

The State is paying more attention to building good roads now than heretofore, the advantage of which in the development of resources is obvious. Construction on the State road from Nephi to the northern boundary of Juab County, a distance of 20 miles, began Sept. 16. The estimated cost of the road, which will be made from quartzite surfaced with shale, will be about $1000 per mile.

Park City is becoming a camp of larger corporations. The Uintah-Treasure Hill Company has been absorbed by the Silver King Coalition. The stockholders of the former company met in Provo Sept. 20, and passed resolutions to the effect that the affairs of the company be wound up, the assets distributed and the corporation dissolved. A petition to this effect will be made to the court now in session at Provo. The treasury contains $106,331.70, resulting from the sale of the company's claims to the Silver King Coalition. There are 998,050 shares outstanding, so that stockholders will receive 10.65c. per share as a final distribution.

The proposed merger of the Daly and Ontario companies was considered by the stockholders of the Daly company at a special meeting held Sept. 20. The question was discussed of turning over the property to a new company to be organized under the laws of the State of Nevada, with 300,000 shares par value $5, in consideration of 75,000 shares of stock. The Ontario is to receive 150,000 shares and 75,000 shares are to remain in the treasury. Many Daly stockholders believe that their company should receive a larger amount of the stock or that the Ontario should get less. The meeting adjourned until Sept. 29 to give more time for consideration. The Ontario stockholders will meet in San Francisco, Oct. 10, to take action in the matter.

Porcupine

Sept. 22—The delegation sent from Porcupine to Toronto to petition the Ontario government to build a wagon road through the townships of Shaw and Deloro, has been successful. The development of this section of the Porcupine camp has been held back since the fire on account of the lack of roads, but the government has promised to start construction immediately. A number of promising properties will be served, and work will proceed much more rapidly.

A writ has been obtained at Osgood Hall by H. F. Darrell, A. McDonald and F. G. Forst, of Toronto, against John R. Carter, S. R. Clark and Allan McPherson, demanding $60,000. The plaintiffs claim this amount as commission for selling 1,500,000 shares of the capital stock of the Success Gold Mining Company to William Laing Malcolmson, of London, England.

The money derived from the recent stock issue of the Dome Mines, Ltd., commonly known as the Dome, will be used to meet the expense of the new equipment, to replace that destroyed by the fire. The stock will not be offered to the public, as the company is practically a close corporation. The last sale of the stock was at $40 per share. This company is making remarkable progress in its work of rebuilding, and although little is said, it is confidently expected that stamps will be dropping about the first of the year.

Cobalt

Sept. 22—The shipments from the Cobalt camp for the month of August, exceeded by 500 tons the total shipments of any month during the present year. They show a decrease, however, of 100 tons, compared with August of 1910. To date for the present year shipments are 5000 tons behind the corresponding period of last year, but government returns show that the production of silver is greater, due to the greater tonnage of concentrates.

It is stated that the Thorold smeltery will be moved from St. Catherines, Ont., to Niagara Falls, N. Y. This action has been considered necessary on account of the duty of 25c. per lb. on cobalt oxide, of which a great deal is produced at the plant. Canadian smelteries of Cobalt ores have generally not been a commercial success, due to the comparatively low charges and the high cost of treating small tonnages. Where the arsenic and cobalt oxide is saved, the process is complicated.

Chihuahua

Sept. 18—Mining operations throughout Chihuahua and adjoining states show constant increase both in number and scope. Work in the off-the-railroad camps is once more normal and considerable new work is either under way or being planned at properties in the Terrazas, Parral, Santa Eulalia, Naica and Guadalupe y Calvo camps. It is not known when the American Smelting and Refining Company is to start the Chihuahua smeltery, but it is believed that it will be some time in November. The Rio Tinto Copper Company is receiving sulphide ore from the Santa Eulalia camp and it is surmised that the smelting plant will shortly be put into commission.

The San Rafael y Anexas company, of Pachuca, has commenced work at its lately acquired property in the Minas Nuevas part of Parral. This is in the vicinity of the Veta Colorado and Veta Grande mines.

There is again considerable talk about the probability of the early building of the proposed railroad from Tepehuanes to Guanaceví. There are large quantities of ore that can be moved over a railroad but which will not stand the mule-back or wagon haul. Several cyanide plants are now being operated in the camp and results are reported as satisfactory.

Prospectors are again in the field, particularly in the better known districts in the western part of the state. Owing to revolution the work of prospecting has been almost nil for about nine months. A number of important ore discoveries are reported.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

A highway robbery occurred near Flat City recently, in which $35,000 in gold dust were taken from George Friend, a Flat creek miner, and a party of armed guards. The dust was from the last cleanup on the Bonanza Association claim.

Perseverance—This company is considering the installation of a large stamp mill on the property at Juneau next year. A $10,000 shipment of bullion was made recently.

Chichagoff—Regular shipments are being made and the installation of additional machinery on the property near Sitka is being considered.

Alaska Exploration—This company, which has in the past confined its operations to hydraulic work, announces its intention to work quartz properties as well, and will purchase new machinery. G. G. Lemons, Fairbanks, is manager.

Copper Mountain—E. F. Gray is making preparations to install a leaching plant on his copper property on this mountain, situated at Mile 146 on the Copper River & Northwestern railroad.

Arizona

Gila County

Inspiration—A party of engineers is making preliminary surveys for an auxiliary pumping station and reservoir at the Inspiration ranch on Miami flat just below the Miami Copper Company's pumping station at Burch about four miles from the Inspiration mine.

Live Oak—From 600 to 1000 ft. of capping must be drilled through on the western end of the property before the orebody is penetrated. The crosscut on the fourth level has not yet reached the orebody. Shaft No. 2, of two compartments, being sunk near the western boundary for development purposes and to check up the results obtained by churn drilling is about 780 ft. deep and is advancing about 5 ft. per day. It is still in ore, having penetrated the orebody at a depth of 705 ft., the orebody being 200 ft. thick. An engineer has been sampling the ore in this shaft and manager M. E. McCarthy states that his results agree closely with those obtained by the Live Oak engineers.

Miami—The production of refined copper amounts to about 1,800,000 lb. per month. Two 6-ft. Evans-Waddell chilean mills are being installed in the fifth section to do the fine grinding. This is being accomplished in the first 3 sections with 6-ft. Trent chilean mills and in the first half of the fourth section with an 8-ft. Hardinge pebble mill. Mining operations are progressing smoothly.

Superior & Boston—A great variety of rock formations has been cut by the McGaw shaft. From the surface to the fourth level, it was in diabase; from the fourth to the eighth, in limestone; from the eighth to the tenth, in quartzite; from the tenth level to the present depth, in diabase. Over 700,000 gal. per day are being pumped, of which about 50,000 come from the shaft, the rest coming from the levels. Aside from this, the only development at present is in the winze below the 1000-ft. level.

Magma—The old Silver Queen mine at Superior which is now owned by the Gunn-Thompson interests operating as the Magma Copper Company, is being developed by a force of 25 men. A crosscut is being driven from the vertical shaft on the 800-ft. level to cut a shoot of high-grade chalcocite ore, 120 ft. long, which was opened up on the 600. Five 6-horse teams are hauling supplies from Florence, and ore on the return trip.

Southwestern Miami—Churn-drill hole No. 1, at the western end of the Miami-Inspiration ore zone, is now down 820 ft. in schist, heavily impregnated with the silicate and carbonates of copper. The management expects to drill into chalcocite ore at any time. A string of 8¼-in. tools was lost in the hole at a depth of 670 ft. Half of the string was recovered and the crew managed to drill past the other half with a new string of the same size.

California

Amador County

Bunker Hill—The cleanup for August is reported to be approximately $200,000, much larger than for the last several months.

Butte County

Gold Queen—The Gold Bank mine, idle for 10 years, is being reopened to make an entrance to the Gold Queen. Roads are being repaired for the hauling in of machinery.

Natomas Consolidated—Feather No. 3 dredge was put in commission near Thermalito, Sept. 10. This is the third 15-cu.ft. dredge completed by the Hammon interests in the present year.

Calaveras County

Smyth—A new hoist, ore bins and other surface improvements are under construction at this mine near Altaville. The 10-stamp mill is being overhauled and is to be put in commission again. Drifting is in progress from the 100-ft. level of the 150-ft. main shaft. C. D. Smyth is managing owner.

Humboldt County

Horse Mountain—The development work on this copper property, 24 miles east of Korbel, has been paid for with ore packed six miles by mules to the county road and shipped to Tacoma. Packing, wagon, water freight and working charges amount to about $25 per ton, and the cost of extraction is said to be low, as no pumping is necessary; the ore is hand sorted and said to contain about 10 per cent. copper. The new concentrating and leaching plant is expected to be in operation in January. It is estimated that the ore can be extracted and treated for $4 per ton.

Inyo County

Four Metals—The orebody reported in the crosscut from the 700-ft. level in the Union claim of the Cerro Gordo group runs northerly from the upraise between the 900- and the 700-ft. levels; three new levels are to be driven between them. Machine drills will be installed.

Mariposa County

Trujhillo—The company at Big Grizzly is installing a Pierce amalgamating plant.

McAlpine—The main shaft is being unwatered in preparation for extensive development. The Garibaldi, an adjoining claim, has been bonded and the Big Oak flat ditch has been purchased. Frank R. Whitcomb, of San Francisco, is manager.

Nevada County

Union Hill—The 20-stamp mill recently erected is crushing 100 tons of ore per day. The mine is well equipped with pumping and hoisting plant and Sullivan drills. The entire plant will be increased if the continued sinking warrants.

St. Gothard—This gold mining company is preparing to construct 30,000 ft. of flume, having taken water rights in the Middle Yuba at the head of the old San Juan ditch.

San Bernardino County

Virginia Dale Gold Mining Company—This is a new incorporation recently formed to operate the Virginia Dale mine, 45 miles south of Amboy, which was purchased by O. S. Hickey and John M.

Taylor, who are the president and secretary, respectively, of the new company. The head office is Merchants Trust building, Los Angeles. The capital stock is $500,000.

United Greenwater Copper Company—This company has filed incorporation records in this county. The principal copper properties are in Inyo county and the head office is at Tonopah. The incorporators are Malcom L. McDonald, Lewis A. Parkhurst, H. Monteath, C. H. Bronte, A. P. Sawyer. The company has been in existence for five years.

Colorado

Clear Creek County

The Lucennia tunnel, on Fall river, has cut a large vein of ore about 6000 ft. from the portal. It is supposed to be the Emerson lode, well known as a rich one on the surface, and owned for about four miles along its outcrop by Sternberger brothers, New York. The New Era mill, at Freeland, is running steadily on the dump of that property, which is believed to contain about $20,000 worth of ore. The Waltham mill, capacity 25 tons per day, is also running on dump ore at the mouth of the Central tunnel. Manager Lubrick is in charge.

Cripple Creek District

P. T.—J. W. Dowd & Co., operating the mines on Chicago creek, are putting in a Malm process mill and the new treatment scheme is being watched with great interest.

Leadville

Favorite—Doran and Berger, lessees, are reported to have struck an extension of the Cleveland fissure.

Star Consolidated Mines—This Carbonate hill company is stated to be shipping 4000 tons of carbonate of zinc ore per month, with iron tonnage the same as usual.

Penn—The mine, on Bruce hill, is hoisting about 100 tons of ore per day.

Ouray County

Camp Bird—During the quarter ended July 31, the mill crushed 18,911 tons of ore. Total receipts were $426,935; expenses, $154,349; net profit, $272,586. A total of 1279 ft. of opening work was done at the mine.

Park County

Dolly Varden—The orebodies in this mine have increased in size and the working force has been increased.

Nelson—A rich oreshoot has been opened containing gold and silver, and shipments are to commence about Sept. 25. W. R. Robertson is the lessee.

Summit County

Wellington—The mill is turning out about 50 tons per day of silver-lead concentrates, the zinc and iron tailings being impounded for future treatment.

Fredonia—The mine, south of Breckenridge, is to be reopened. A mill has just been completed and is ready to crush ore.

Buffalo—This placer company, operating a steam shovel and sluice boxes 11 miles north of Breckenridge, is reported to have made a cleanup averaging 50c. per cubic yard.

Teller County

Union Leasing Company—In August, 76 cars of medium-grade gold ore were shipped from the Husted shaft of the Gold Dollar, Gold Sovereign and Prince Albert. C. G. Jackson is superintendent.

Last Dollar—This property, operated for the past two years by Gilder & Co. and their sub-lessees, has been taken over by the company and will be worked on company account.

Gold Dollar—The output for August was 85 cars of mill ore, returning over $4000 in royalties. Thirty set of leasers are at work.

Elkton—The main vein has been drifted on at a depth of 60 ft. below the ninth level, and has some of the best ore in the mine for a length of 200 feet.

Peggy—This mine, at Anaconda, is reported to have opened a rich shoot at the 400-ft. level. Samples taken across 4 ft. are said to run 5 oz. gold per ton.

Michigan

Copper

Victoria—The new shaft is down about 700 ft., conditions as regards copper content remaining about the same as at shallower depths, although drifts from No. 2 shaft in the lower workings toward this shaft are indicative of better results to be expected with greater depth. No. 2 shaft remains bottomed at the 22 level.

Ahmeek—About 2000 tons of rock per day are being sent to the mill. Three heads are in operation continuously and the fourth about one-half of the time.

Winona—The mill is stamping about 500 tons of rock per day, yielding about 15 lb. copper per ton. Changes are contemplated in the mill by which it is hoped to increase the mineral yield materially.

Wolverine—The shaft, sinking on the Osceola amygdaloid lode, is down about 300 ft. and has encountered an encouraging run of copper ground. It is likely that drifting at this point will be started soon.

Keweenaw—Activity is centered in shaft sinking on the Kearsarge lode. A depth of about 1250 ft. has been reached, with copper showing from time to time, although no continuous runs of good ground have been exposed.

Iron

The Oliver Iron Mining Company is exploring lands held under option in the Republic district in the vicinity of the Riverside and Standard properties. Four drills have been in operation for some time and two more have been started remently. Of the six drills, two are operating near Trout creek, south of Republic.

Iron River Ore Company—It is reported that ore has been found by drilling on the Canal forty, in the vicinity of Iron River.

Imperial—At this mine, on the Marquette range, work on the engine house has started and the warehouse is completed.

Minnesota

Cuyuna Range

F. S. Adams has secured five options on iron lands on the Cuyuna range, and the drilling will open up to exploration a large tract of land lying near Perch and Nokay lakes in the township of Nokay Lake, east of Brainerd.

Cuyuna-Duluth Iron Company—This company has been organized recently by Brainerd and Duluth men. A drill is in operation on the property situated in S.4-T.46-R.29, and adjoining the Cuyuna Mille Lacs Iron Company's land.

Iron Mountain—The shaft is down 40 ft. on the property in S.33-T.47-R.29 and is expected to enter the orebody within 20 feet.

Mesabi Range

The Oliver Iron Mining Company is exerting great effort to protect their employees from accident. Safety devices are being rapidly installed and include screen guards around cog, belt, pulley and flywheels, in all machine shops and engine rooms. Runways are also being placed beneath all overhead shafting and pulleys.

Sharon—It is reported that the Oliver company has decided to strip this property and also to explore an adjoining forty. The Sharon property adjoins the village of Buhl on the north. Stripping was started 12 years ago by the Drake & Stratton company, but was discontinued owing to a dispute regarding ownership.

Missouri

Red Lion—This mill, belonging to Ranis & Moore, at Joplin, was burned to the ground.

Chicago-Joplin—This company which has been one of the largest producers in the Joplin district is now running its tailings.

Empress No. 2—This company at Webb City has given up its lease on the Guinn land and removed its mill.

Fortune Teller—The company has sold its pile of 750 tons of silicate of zinc, at Granby, to the Granby Mining and Smelting Company. The ore was sold on a $26 base and brought about $30.

Weaver—Three shafts are in ore at the mine, six miles north of Carl Junction, and the mill is ready to operate.

Montana

Butte District

Anaconda—Owing to a partial shutdown of a few days for repairs of the Boston & Montana smeltery at Great Falls, the Mountain View and Pennsylvania mines were closed down on Sept. 14 for several days. New guides are being installed in the air shaft between the 1600-ft. and 1800-ft. levels. On the 800-ft. and 1100-ft. levels, electric motors are in operation, in place of horses used previously in hauling ore to the skip-pits at the shaft; also on the 1800-ft. level, the main drifts and crosscuts have been widened and retimbered, and heavy steel laid in preparation for hauling by electric motors. On the 100-ft. level, which has long been considered practically worked out, a crosscut running north, recently cut a vein of ore, upon which drifting is being carried in both directions.

East Butte—The company now has an output of about 1,000,000 lb. of copper per month, including that from its own mines and custom work, and is earning between $40,000 and $50,000 net per month, which on its present valuation of 300,000 shares, gives earnings of nearly $2 per share. The payment of $2,000,000 on the Pittsmont property, which includes the smeltery, falls due Dec. 1, and while it is thought the company will not be quite ready to pay that amount at the time it is due, the payment can be extended well into 1912.

Cascade County

Snow Creek—The property, near Neihart, has the honor of producing the first gold by cyaniding in Cascade county. The cyanide plant was installed last summer and owing to the cost of transporting ore from the mine to the mill, has been worked on a small scale. It is being planned to build a tramway 2000 ft. long from the mine to the mill. The gold is in the form of a brick weighing 410 ounces.

Deerlodge County

Hidden Lake—The lease and bond held by Harry Bacorn on this group of 18 claims will expire on Oct. 1. During the time that Mr. Bacorn has operated the mine it has netted about $1000 per week, after deducting the owners' share of 15 per cent., and the average of the ore shipped to the Washoe smeltery has been $24 per ton in gold. About 90 per cent. of the contents are being saved at present by a cyanide plant, which was built a few months ago. In case Mr. Bacorn does not take up the bond Oct. 1, the owners will add to the operating plant and continue operations themselves.

Oro Fino—At the mine in the Georgetown district a new vein was struck recently carrying high-grade gold ore, and Manager Charles Bostrom shipped a car to the Washoe smeltery. This is the first shipment of ore in several months.

Nevada

Comstock Lode

Mexican—Grading has been finished for the new 100-ton mill; approaches and retaining walls are completed. The framework is now being put in place, and the machinery installed. The chutes on the 2500 level are full of first-class ore, aside from a large accumulation on the surface dumps. The recovery last week was $16,543.

Ophir—The ore recovery last week was 397 tons, averaging $49.41 per ton, and totaling $19,615, the largest single week's extraction in nearly two years. The 2100-level stope gave the highest output, 265 tons averaging $66 per ton. Work on the 2500 level is still suspended, pending the carrying out of further pumping plans.

Con Virginia—The main southwest prospecting drift on the 2550 level is being extended, and is in the vein for the full width. This level has never been opened up, and is about 300 ft. east of any former workings.

Union Consolidated—More quartz is coming in at the bottom of the joint winze with the Sierra Nevada, at a point between 50 and 60 ft. below the 2500 level. Both the porphyry and quartz give low assays.

Ward Shaft—Diamond drilling has been started from the raise in the Julia Consolidated connecting drift on the 2000 level.

Utah

Beaver County

Moscow Mining and Milling—During the last year the company has paid off a $30,000 bonded indebtedness, and has spent $6000 for water facilities. Sinking below the 400 level is being continued.

South Utah—Development on the 700 level is opening up ore above average grade. This is the same orebody as that encountered on the 600-ft. level. In the concentrating mill, the management is experimenting with classifiers, and is installing regrinding rolls.

Juab County

Tintic shipments for the week ended Sept. 15, amounted to 139 cars, a considerable increase over those of the week preceding.

Union Chief—The main tunnel, which is being driven in the limestone to cut the vein is in 1300 ft., and shows iron stains. Three drills are in use, and an average of 4 ft. per day is being made toward the contact, about 200 ft. distant.

Santaquin Chief—Three feet of steel galena has been opened a short distance from the surface in a tunnel started on an outcropping vein. This property, south of the Union Chief, is about three miles from the railroad loading station.

Scranton—The body of shipping ore recently opened has been followed for 500 ft. along the trend, and varies from four to 20 ft. in width. During August 250 tons of lead and 700 tons of zinc-lead ore were shipped.

Eagle & Blue Bell—About three cars per week are being shipped. The winze from the 1200-ft. level is down 116 ft. in good ore and a drift has been started.

Swansea—Total receipts for the year ended Sept., 1911, were $12,691 and disbursements were $12,691, of which $12,305 were operating expenses. Drifting to the north on the 940 level is in progress, and preparations for drifting south are being made. No work has been done on the 700-ft. level south of the shaft or on the 800-ft. level north of it; there are 250 ft. north and 150 ft. south of new ground, which can be stoped from this level. A lease operating on the 700 is producing about one car per month. An electric station pump to handle the water during shaft sinking has been purchased. There are over 5½ miles of workings on the property, which embraces the territory of the Swansea Mining, the South Swansea, and the Four Acres, making in all 145.34 acres. John Hoffman has succeeded James Dugan as superintendent.

Iron Blossom—During August 150 tons per day were sent out from the No. 1 workings; the No. 3 workings are producing 80 tons per day, and development is more than keeping up with production. Diamond drill operations on the 1900-ft. level of the No. 1 workings continue, and the hole driven to the southeast is in 1100 feet.

Clift—Three cars of ore running $40 per ton, and which, it is reported, will bring in about $5000 have been mined recently.

Crown Point—Drifting is being done on the 400 level, and the face is about 270 ft. from the shaft.

Tooele County

Monitor—Ore found on the surface at this property, near the Ophir Hill mine, at Ophir, carries 10 per cent. lead, and from 18 to 28 oz. silver. A tunnel has been started on the ore.

Mayflower—Ore carrying some silver is reported in the bottom of the 200-ft. incline shaft at this property, in the Stansbury range, west of Grantsville.

Saltania—This property is under an 18-months lease and bond to Salt Lake men. A cave was cut recently in the main tunnel, and is said to show ore running from 25 to 35 per cent. lead.

Utah County

Mineral Flat—At the annual stockholders' meeting held Sept. 5, Jesse Knight, J. C. Jensen, W. L. Mangum, J. William Knight, and R. E. Allen were elected directors. Only sufficient work to retain title to the unpatented claims has

been done since 1910, when operations were suspended. Two men are employed in doing assessment work on individual claims, and in extending the south drift of the main tunnel. The power plant rented at $50 per month is the only source of revenue at present.

Washington

Ferry County

Quilp—This company is preparing to ship a car of ore taken from the 440-ft. level, and expects to make regular shipments soon. E. L. Tate, Republic, is president.

McKinley—The company is considering the installation of a 100-ton stamp mill on the property early next year. C. F. Wickstrom, Orient, has charge of the operations.

Lone Pine—Good ore has been encountered on this property, near Oroville. New machinery is now being installed and will soon be ready for operation.

Ben Hur—A new pump and other machinery are being installed at this mine in the Republic district.

Philippine Islands

Chambers—Exploration on this copper group in the Mancayan district is in progress. The main crosscut has been driven 655 ft. and indications of an orebody reached.

Colorado—This company has its mill nearly completed in the Masbate district and expects to be in full operation in October.

Canada

British Columbia

Princeton Coal—The directors in England have authorized the resident manager to put in a plant for sizing and dry-cleaning the coal at the company's mine, at Princeton, Similkameen. Present output is about 100 tons per day.

Silverton Mines—One unit of an Elmore vacuum plant has been placed in this company's concentrating mill, on Four-mile creek, Slocan. The ore contains much freibergite and ruby silver, and in places there is zinc.

Marvel Gold—The Merrill 6-stamp mill has been overhauled and is again in running order; the aërial tramway has been repaired, the mine cleaned out and some test runs made on small lots of ore. This property is on Siwash creek, Yale Mining division.

French's Complex Ore Reduction Company—It is reported that the company will erect, in Nelson, a plant for the treatment of the zinc ores of this district. The process to be used will be that invented by A. Gordon French.

Canadian Consolidated—The company has taken a bond on the H. B. group of six claims at Deer creek, in the Sheep Creek camp. The price reported is about $500,000, and the ore is lead carbonate.

Ontario—Cobalt

The shipments from Cobalt for the week ended Sept. 15 were: McKinley-Darragh, 269,330; La Rose, 148,280; Coniagas, 123,150; Drummond, 120,000; City of Cobalt, 106,000; Trethewey, 100,800; Townsite, 100,520; O'Brien, 64,010; Chambers-Ferland, 64,000; Temiskaming, 62,220; Cobalt Lake, 62,000; Kerr Lake, 60,620; Buffalo, 46,410; total, 1,327,340 lb. Bullion shipments were: Buffalo, 9300 oz.; Nipissing, 39,307 oz.; total, 48,607 ounces.

Nipissing—During August the company mined ore amounting to $224,555, and shipped ore totaling $161,960. A statement as of Sept. 16 showed cash on hand $794,699, ore in transit valued at $241,815, ore ready for shipment $213,696; total, $1,250,210.

Hudson Bay—Work has been resumed on this company's Gowganda property, which has been closed down for some time, owing to a strike. Good ore has been opened on the 50-ft. level.

Temiskaming—The main shaft is sinking below the 575-ft. level and will be sunk to a depth of 650 ft., where the eighth level will be cut.

Gowganda Mines, Ltd.—The affairs of this company are being wound up. Oster Wade & Co., Toronto, have been appointed provisional liquidators.

Ontario—Porcupine

Pearl Lake—Diamond drilling on this property has proved the existance of pay ore at depths of 640 and 780 feet.

Dome Extension—Part of the new plant is on the ground and will be installed immediately.

Success—A new vein carrying good ore has been uncovered on the surface of the property.

Davidson—Free gold has been found at a depth of 25 ft. in the shaft.

McAuley-Bridge—A diamond drill is to be installed on this property in Bristol township. The results will be of great interest to many property owners, as this is practically a new district. Underground operations are giving satisfactory results.

Mulholland—A body of sulphates, carrying gold, has been opened on the 100-ft. level.

Royal Dome—This is a new company organized in Chicago to develop a claim adjoining the Preston East Dome.

McIntyre—At No. 1 shaft the vein has been opened up on the 100-ft. level for 300 ft., and shows about 5 ft. of good ore. The shaft is being put down an additional 100 ft. At No. 4 shaft good ore is being mined at the 100-ft. level, where the vein has been opened up for 200 feet.

Swastika—The 12-drill compressor plant which has been installed, will be put in operation Oct. 1, with machinery sufficient to accomplish 600 ft. per month in underground prospecting. The mine is under the management of Capt. John Reddington.

Mexico

Chihuahua

Parral Fire Clay Company—Machinery is being installed and work on a large kiln was started a week ago.

Cherokee Goldfields, Ltd.—Development work is being done at the property of this company in the San Julian district south of Parral. H. D. Higgins is in charge.

Santa Ana—It is reported that this mine, in the Parral district, is to be developed at depth. It is owned by F. Pothast and Charles Seawell.

Aguilereña—This old mine, near Cerro de la Cruz, has been leased to Edgar Kock and Carlos Nausester who will start work at once.

West Mexican—It is understood that the work of building the 200-ton cyanide plant will be resumed at this mine in the Guadalupe y Calvo district.

Colima

It is reported that a French syndicate has taken a bond on the Mamey iron deposits. The examination was made by Ferdinand Sustersic and the price asked is said to be $500,000.

Jalisco

The Casados Mining Company and the El Favor Mining Company will contribute equally to the expense of building a wagon road from the mines in the Hostotipaquillo district to La Quemada, a station on the Southern Pacific railroad. It is the intention to use electric trucks for hauling.

Zapote—The bond on this property in the Ameca district has been extended to E. A. Montgomery for one year. The shaft will be sunk to the 500-ft. level.

Mexico

Esperanza—During August the mill ran 25 days and crushed 20,585 tons of ore. Total receipts were $132,084; expenses, $103,432; net profit, $27,118.

Sonora

El Tigre—The August production of bullion weighed 4789 lb. and was valued at $90,000. The new cyanide plant is treating old tailings upon which a recovery of $1000 per day is being made.

Aldazora Gold Mines Company—A tunnel is being driven to intersect the vein at a depth of 500 ft. The face is now 300 ft. from the portal.

La Cobriza Copper Company—This company is planning important improvements. Three 100-h.p. boilers, a double-drum hoist and a 12-drill compressor have been ordered. More than 3000 ft. of development work has been done.

The Markets

Coal Trade Review

The present number of the JOURNAL is the last in which detailed reports of the coal market and correspondence from coal trade centers appear. Hereafter we shall give only a brief general review of coal market conditions. Statistics of coal production and movement, and local correspondence—on a much extended scale—will be found from this date in our new weekly, COAL AGE.

The coal markets in the West do not show much improvement; it might be said that they are inclined to improve, but do not make actual progress. Of course, as the season advances there is a greater demand for domestic coal, but this has been rather delayed by an unusually warm September. Steam coal consumption increases slowly, though there is a slight improvement at many points.

The seaboard bituminous trade is in rather better shape and there is a moderate gain in the sales of steam coal, due to better working at mills. From Hampton Roads a better demand for bunker and off-shore trade is reported.

The anthracite trade is steady, as usual. The miners' union is already formulating demands to be submitted when the present agreement expires, next April.

COAL TRAFFIC NOTES

Coal tonnage of Norfolk & Western railroad, two months of fiscal year from July 1 to Aug. 31, short tons:

Field:	Commercial	Company	Total
Pocahontas	2,268,683	153,242	2,421,925
Tug River	297,673	75,385	373,058
Thacker	324,745	104,995	429,740
Kenova	170,739	22,324	193,063
Clinch Valley	206,357	10,855	217,212
Total	3,268,197	366,801	3,634,998
Total, 1910	2,661,564	259,446	2,921,010

The total increase this year was 713,988 tons, or 24.4 per cent.

Coal and coke tonnage of Chesapeake & Ohio railway for Juluy, short tons:

	Coal	Coke	Total
Tidewater	294,589	...	294,589
Points east of mines	137,747	10,181	147,928
Points west	909,108	4,762	913,870
Conn. lines	17,976	1,866	19,842
Total	1,359,420	16,809	1,376,229
Total, 1910	1,352,233	33,367	1,385,600

The total decrease this year was 9371 tons, or 0.7 per cent. Tidewater tonnage this year was 22 per cent. of the total; eastbound, 10; westbound, 47; connecting lines, 1 per cent.

New York

ANTHRACITE

Sept. 27—Trade continues good, and there is every prospect of large September shipments. In steam sizes business continues active. Buckwheat is in rather better supply.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Schedule quotations for domestic sizes are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut; all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.30@2.70; No. 2 buckwheat or rice, $1.75@2.15; barley. $1.50@1.70; all according to quality, f.o.b. New York harbor.

BITUMINOUS

Harbor trade is rather quiet this week, but coastwise business is still improving. All-rail trade is reported fair. Car supply on the West Virginia lines has caused some complaint, and will probably continue to do so till the Lake trade is over. There seems to be plenty of coal at tide here, though a little shortage is said to be felt at the Hampton Roads ports.

Prices remain about the same. A good steam coal can be had for $2.50@2.60, f.o.b. New York harbor; lower grades sell down to $2.35 and better up to $2.90. Gas coals are $1.15@1.20 for ¾-in., and $1.05@1.10 for run-of-mine, at mines. Slack is still uncertain.

In the coastwise trade vessels are in good supply, except that small boats for the shoalwater ports are rather scarce just now. From New York going rates are 55@60c. to Boston or Portland, with 10 or 15c. more to the shoalwater and towage ports; 35@40c. to Providence and Fall River; 25c. to the Sound. From Philadelphia to Boston or Portland, 70@80c. is quoted. From Norfolk or Newport News to Boston, 65@70c. is asked.

Birmingham

Sept. 25—The coal trade in Alabama is picking up steadily and the production is being increased right along. Some of the smaller coal companies in the Birmingham district are not only increasing the working time at their collieries but are also adding men.

The coke production is being increased. There is a steady demand with prices remaining firm.

Chicago

Sept. 25—Sales of Illinois and Indiana coals are gradually growing larger, but domestic coals are perhaps a little easier, owing to large supply and the reluctance of retailers to lay in stocks in advance of actual demands from consumers. The steam-coal situation is notably bettering; domestic coals must wait the first few cool days for vigorous movement. Eastern coals in general are in good demand and will not lose ground as the season progresses, to judge from all present indications. Western coals, of course, are in good supply and the dangers of car shortage seem yet remote. With the large receipts constantly coming from western mines prices hold to a low level, yet with a fair profit to those who sell on conditions of normal demand and without the need of getting rid of surplus stock on tracks.

Illinois and Indiana coals in cars bring $2@2.45 for lump, $1.75@1.90 for run-of-mine and $1.15@1.45 for screenings. The demand for screenings—the most popular size for many months—is strengthening, but conditions of production are giving a larger proportion of screenings and so the prices do not change notably. Of coals from east of Indiana Hocking is still strongest, though in larger supply than usual in the last week, with the price wobbly around the list, $3.15. Smokeless is still scarce as regards lump, which holds to $4.05, and smokeless run-of-mine at $3.05 is plentiful though in good demand.

Cleveland

Sept. 25—The Lake trade is active, and local business seems to be improving. Car service is better and coal is coming forward freely, especially for Lake shipments.

Prices are unchanged. Middle District coal, f.o.b. Cleveland, is $2.15 for 1¼-in. $1.90 for ¾-in. and $1.80 for run-of-mine. Slack is in oversupply and prices are variable. Pocahontas brings $2.25@2.35 for lump; $2.35@2.45 for run-of-mine.

Indianapolis

Sept. 25—Both operators and miners are encouraged because there is more work in the mines at present than for several months. The cry that a coal shortage was imminent because the retailers were neglecting to stock up and because the railroads were incapacitated by reason of laying off large numbers of men, while an old cry, has had an apparent effect in Indiana. A number of dealers have become active and sent in their orders for storage coal. It is admitted that the railroad movement of coal is not up to the normal for this period of the year, but the officials say that conditions do not indicate a shortage of coal to any extent. It is believed that the midsummer weather has had much to do with the neglect on the part of retailers to store their supply. The reports from

the industries are slightly encouraging but the demand for coal for the railroad shops is considerably limited for this season of the year.

Pittsburg

Sept. 26—There is no material change in the coal situation. Lake shipments are heavy, but there is still complaint of congestion at upper Lake points and it will require heavier movement than usual next month to bring the season's total up to expectations. Demand for coal for manufacturing purposes is unchanged, but for domestic coal is improved. We continue to quote: Nut, $1.10@1.15; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 60@75c. per ton, at mine.

Connellsville Coke—The market has been quiet but firm, production and consumption having been practically unchanged for several weeks and prices well established, according to existing conditions. Sales totaling between 75 and 80 cars of furnace coke for prompt shipment have been made in the week, about half going east and half west, while nothing has been done in contract furnace coke. The foundry-coke movement is rather slow. We continue to quote: Prompt furnace, $1.50@1.55; contracts over last quarter, $1.70@1.75; prompt foundry, $1.85@2; contract foundry, $2 @2.25, at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Sept. 16 at 310,743 tons, a decrease of 19,000 tons, and shipments at 4545 cars to Pittsburg, 4582 cars to points west and 995 cars to points east, a total of 9122 cars.

St. Louis

Sept. 25—The market for September has been slow and seems to be worse toward the latter end of the month than it was at the beginning; on the whole it has been very disappointing to operators, who have had a hard time in maintaining the price on even the high-grade coals to the trade. Nearly all operators in the Carterville district carried over a large number of orders for the domestic sizes into September, which made them feel confident of a good market. However, these orders are now being rapidly filled and there is very little business in sight. The market for Standard coal has been poor and while there is no chance for a decrease in price, it is still selling for less than cost. Screenings have been also dragging badly and have continued to ease off.

The tonnage reports up to date show a decrease from 1910 and an increase over 1908 and 1909, but so small it is scarcely worth mentioning. Up to Sept. 21 a total of 429,388 tons of coal was received at East St. Louis.

Anthracite—The market has been just fair and the city business rather slow. Country demand for chestnut has been quite brisk.

FOREIGN·COAL·TRADE

Belgian Coal Trade—Exports and imports of fuel in Belgium, half-year ended June 30, metric tons:

	Exports	Imports	Excess
Coal	3,696,581	2,585,833	Exp. 1,110,748
Coke	333,436	501,187	Imp. 167,751
Briquets	185,236	251,983	Exp. 66,74
Total	4,215,253	3,339,003	Exp. 876,250
Total, 1910	3,412,728	3,093,577	Exp. 319,151

Exports are chiefly to France and Holland; imports principally from Germany.

Belgian Coal Consumption—Coal consumption in Belgium, half-year ended June 30, metric tons:

Stocks, Jan. 1	829,300
Production	11,547,000
Imports	4,296,800
Total supplies	16,673,100
Exports	3,464,200
Stocks, June 30	882,400
Total deductions	4,346,600
Consumption	12,326,500

The consumption shows an increase of 232,500 tons over the first half of last year.

Spanish Imports—Imports of coal in Spain, seven months ended July 31, were 1,225,864 metric tons, an increase of 34,105 tons over 1910; imports of coke, 186,459 tons, an increase of 30,709 tons.

Novo Scotia Coal—Shipments of coal from Nova Scotia mines, eight months ended Aug. 31, long tons:

Company	1910	1911	Changes
Dominion	1,948,344	2,344,654	I. 396,310
Nova Scotia Steel	514,415	419,416	D. 94,999
Acadia	168,545	253,519	I. 84,974
Intercolonial	164,038	166,188	I. 2,150
Inverness	171,502	175,267	I. 3,765
Total	2,966,844	3,359,044	I. 392,300

The total increase this year was 13.2 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal for export on Sept. 15 as follows: Best Welsh steam, $4.32; seconds, $3.99; thirds, $3.78; dry coals, $4.20; best Monmouthshire, $3.72; seconds, $3.60; best Cardiff steam smalls, $2.28; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Sept. 27—The attention of the markets this week has been diverted to Wall Street by the heavy fall in Steel stocks, and discussion has been largely of the effects of a possible dissolution of the Steel Corporation on the trade. Some people are inclined to think that the whole affair has been engineered for Wall Street and political effect. A statement denying the truth of current reports was issued Sept. 26, but not until after the close of business. The statement is given on another page.

At any rate the mixture of politics and speculation with the trade is not of any advantage to its condition.

If any change is to be noted in finished materials, it is that of an increase in the volume of business. The gain is—as it has been for some weeks past—largely in the way of small orders for comparatively early deliveries. These orders are competed for rather sharply, and prices on the whole have had a lower tendency.

Railroad buying is on the increase, and a number of orders for steel cars are reported. Rail orders have not been large, but have made up quite a fair aggregate tonnage.

Pig iron, like finished material, shows a business largely made up of moderate orders for early delivery. Sellers have realized for some time that buyers generally are carrying light stock, and the present run of orders emphasizes this fact. There is pretty sharp competition on going orders, especially for basic iron, the prices of which have been cut by Pennsylvania furnaces. Foundry iron is in fair demand, both in seaboard and western territory, but is rather firmer than basic. Southern furnaces have been less aggressive competitors for this business.

Baltimore

Sept. 26—Exports for the week included 601,908 lb. zinc dross and 2,801,408 lb. steel billets to Liverpool; 1,405,960 lb. steel rails and 167,791 lb. rail fastenings to Panama. Imports included 6133 tons pyrites from Huelva, Spain; 11,400 tons iron are from Cuba.

Birmingham

Sept. 25—The Southern iron market has gone through another quiet week. There is a claim that the prices of iron have been maintained and $10.25@10.50 is asked for No. 2 foundry. The sales during the past week did not aggregate very much, though for a day or two there were some interesting inquiries received. No sales worthy of mentioning were made during the past week for delivery in 1912. The production in the South for September will show as much, if not more, iron than was made in August. There is, however, no adding to the accumulated stocks of iron.

There is steady activity in the cast-iron pipe field, while in fabricated steel there is a good demand and the rolling mills are working on full time.

Chicago

Sept. 30—Pig iron still remains a slowly moving commodity in the local market, the agitation over the status of the Steel Corporation apparently having the effect of causing users of iron and steel generally to feel doubtful about the future. There is still, of course, a

steady sale of small quantities of pig iron for foundry purposes, the needs of the market not varying to any considerable extent, though speculative buying hardly exists. Southern furnaces quote No. 2 yet at $10.50 Birmingham or $14.85 Chicago, with a possible range of as much at 50c. less on the most favorable sales. Northern No. 2 is weak at $14.25@14.50. The Northern situation becomes acute as stocks accumulate in the furnace yards and an active buying movement does not develop.

In the market for iron and steel products there are fairly strong conditions, with structural material active and railroad supplies in fair demand. Almost everywhere is apparent something of uncertainty about future needs and a tendency to hold off buying except for immediate necessities, which are fairly large.

Cleveland

Sept. 25—A few small sales of ore are reported, but no large business is expected now. Furnaces which have contracts are taking ore from the docks rather slowly.

Contracts have been let and work started for the new ore-unloading plant of the Pennsylvania Railroad at Cleveland. The work is to be completed by the opening of navigation in 1912. The plant will be on the Lake front a short distance from the mouth of the Cuyahoga river. It is expected that this will handle two large carriers a day, or from 25,000 to 30,000 tons. Its four unloaders are to be equipped with 17-ton buckets; the largest in use at the present time hold 15 tons. The capacity of the weighing larry will be 50 tons, which is 15 tons greater than that of any previously built, and that of the receiving hopper will be 65 tons. The motor equipment will be heavier and the speed of operation higher than on anything yet attempted. Provisions will be made not only for unloading the largest carriers now in existence, but also for those of greater width and draft that may be built in the future. In connection with this improvement an area of 43 acres is being reclaimed by filling in between the Government harbor line and the shore. This will provide a frontage on the Lake of about 2000 ft. The work includes the construction of a reinforced-concrete dock 1000 ft. in length; foundations for ore-handling machinery; a 15-ton ore bridge; a power house of 2200 kw. capacity; a haulage system for handling cars under the machines; a yard development for loaded and empty cars, and an undergrade crossing of the Lake Shore railway.

Pig Iron—A few contracts for basic and foundry have been closed, but inquiries are only fair. Specifications on contracts are larger than they have been. Quotations, Cleveland delivery, are $15.90 for bessemer, $13.25@13.50 for basic, $13.75@14 for No. 2 foundry and $13@13.25 for forge.

Finished Material—Business in structural steel and sheets is fair; in plates and bars rather slow. Prices are irregular, especially on sheets. Local mills are better occupied than they have been.

Philadelphia

Sept. 27—Prospects of activity in the pig-iron market are more encouraging than they have been for a long time. Yesterday and today quite a fair volume of new business was booked, especially in pipe iron in which Southern iron figured. New England interests figure prominently in orders for early delivery for the most part and in inquiries for iron to be furnished up to the end of the year and in some cases into the first quarter of next year. Makers have quoted low figures on all inquiries received but this leniency will disappear if the orders now in sight clean up stocks and absorb the furnace output for a few weeks to come. Makers in this territory are anxious to get away from prices which mean but little more than cost of production and for that reason they decline to quote for remote delivery at current prices. The encouraging fact is that stocks of iron in yards are lower than was supposed. Southern makers are not trying very hard for Northern business as the close similarity would imply. No. 2 X can be had at $15, gray forge at $14.50 and less, and basic at $14.50@15 per ton.

Steel Billets—A good week's business has been done in forging billets for early delivery with fair prospects for open-hearth billets. Prices have been reduced to $22.40 for rolling billets and $27.40 for forging.

Bars—Large buyers are favored with special quotations which have been made as low as 1.22c. and buyers of refined bars have been favored with special reductions.

Sheets—Sheets have also been shaded, it is said, and inquiries have accumulated but the shadings made in this market were not in harmony with prices elsewhere.

Pipes and Tubes—No important business has been closed. Buyers are indifferent at present and can afford to wait.

Plates—Unless appearances are unreliable, a large amount of business in steel plates will soon be placed. A general cheapening in raw material is affecting prices and the lowest quotations of the year have been recently made. Further activity is reported today on marine plate and tank. Heavy local requirements running into 10,000 tons or so will soon be presented. Considerable demand is showing up from towns and cities within this territory.

Structural Material—Quite a run of moderate orders have been sent to the mills within a week for material for early delivery. Inquiries are more encouraging.

Scrap—The scrap-iron market is dull and sales have been light. Offers are under consideration for No. 1 railroad wrought in the hands of holders. No. 1 yard scrap has been shaded and some stock gotten rid of. Machinery cast is moving more freely, while No. 1 steel scrap has no sales at this time.

Pittsburg

Sept. 26—The chill which overtook the iron and steel trade about a fortnight ago continues, and reports are, if anything, more pessimistic than the nature of the case calls for, while during the three months preceding the present month every effort was made to set forth conditions in a very favorable light. Conditions on the whole are not altogether as good as three weeks ago, but important factors in molding the sentiment have undoubtedly been disappointment that September did not bring distinct improvement over conditions of July and August, a development which the change of season usually produces, and the declines in Wall Street, which in the iron trade have probably been accepted as indicating fresh and unfavorable developments. There is, however, good reason to conclude that Wall Street has simply been tardy in recognizing that conditions in the steel trade have not for months justified the prices at which steel securities were selling, provided they were not selling too low in 1907, for securities were higher and steel prices much lower.

What is really a very large volume of steel business is being booked. The tonnage is somewhat below what it was at the best period, the latter part of July and the early part of August, but it is not much below the current rate of production, which has decreased very slightly from the average of August. Without an improvement a slight further decrease in production is to be expected, but by no means a large decrease.

Old-fashioned open-market conditions in steel products have prevailed for about three months, and under stress of the competition, prices have been sagging, but very slowly, and it is a question whether they have been falling any more rapidly in the past fortnight than in preceding weeks. The yielding is not uniform, but is seen now in one product and now in another. There is a considerable range in prices of a given commodity according to tonnage, time of delivery and specifications, conditions being quite opposite to those prevailing in the "controlled" market, which has become a thing of the past.

Bars are quotable today at 1.15@1.20c., against 1.20c. for several weeks past. Occasionally 1.10c. is done, but only as an exceptional price. Plates continue quotable at 1.25c. for desirable orders, with this price slightly shaded in excep-

tional cases. While these products have been sagging gradually, structural shapes have had rather a clear-cut decline of $1 a ton in the past 10 days, being quotable today at 1.30c. on ordinarily attractive business, while 1.35c. has been the open quotation since the formal reduction of $1 a ton on May 29. Sheets have not weakened further for several weeks.

Approximately 75 per cent. of the total steel-making capacity of the country is in operation, some of the Steel Corporation subsidiaries doing materially better than this. The Carnegie Steel Company is operating 80 per cent., and a higher percentage than this in its Pittsburg district plants, which have the bulk of the export trade.

Ferromanganese—The market is not quotable on the basis of actual sales, as sellers are quoting uniformly $38.50, Baltimore, for any delivery next year, pursuant to the agreement among the English producers, which is understood to have been consummated Aug. 25, taking in Workington, which had been holding out when the other producers were agreed. This quoting price has not been the basis of any sales so far as learned, last sales reported being at about $37. The Jones & Laughlin Steel Company has closed for about 6000 tons, delivery over next year, at $37, Baltimore, or a trifle higher, but its negotiations were commenced long ago. Prompt lots have lately gone at $36.50, Baltimore, but no recent sales are reported.

Pig Iron—The interest which recently sold 1000 tons of basic iron at $12.60, Valley, $13.50, delivered Pittsburg, would probably sell more iron at this figure. Bessemer remains nominally $15, Valley, but developments by way of a distinct cut would probably follow the appearance of any important inquiry. Foundry iron remains $13.50, furnace, with buying light and only for early delivery. Malleable is weaker, at $13@13.25, Valley, forge remaining at $13, Valley. Freight to Pittsburg is 90c. There is practically no inquiry in the market today.

Steel—Concessions on small lots of openhearth steel have increased, while bessemer quotations are unchanged, the large bessemer mills not wishing to cut prices and thus affect their contracts calling for monthly settlement. Thus, by a vagary of the market openhearth material is quotable at $2 less than bessemer, although quotations for the latter are purely nominal, there being no buying. We quote: Bessemer billets, $21; sheet bars, $22; open-hearth billets, $19; sheet bars, $20, f.o.b. maker's mill, Pittsburg or Youngstown. Rods are nominally $27, Pittsburg.

Sheets—The market is unchanged as to price, cutting apparently having gone the limit in August. Some of the mills which must buy steel are probably less aggressive sellers than formerly, as existing prices are believed to show them a clear loss. Tonnage is about the same as formerly, but a few producers appear to be running better. We quote: Black sheets, 28 gage, 1.90@1.95c.; galvanized, 2.90@2.95; blue annealed, 10 gage, 1.40@1.45c.; painted corrugated roofing, $1.35; galvanized, $2.50 per square.

St. Louis

Sept. 25—The pig-iron market remains much the same. The volume of business is a trifle more than last month and compares favorably with last week or the week before. Sales are confined to small lots of from 100 to 300 tons, mostly for shipments during this year. The price of $10.25@10.50 per ton Birmingham, or $14@14.25 per ton St. Louis, remains the current figure for No. 2 foundry.

Iron Ore Trade

Prices of New York, New Jersey and other local ores to eastern furnaces at present are from 5¾ to 6¼c. per unit of iron at mines—7¼ to 7¾c. per unit delivered—which is about on a parity with Newfoundland ore at Philadelphia, and a little below Spanish ore. Swedish ore imports are mainly under contract. The imports of Cuban ore are nearly all taken by the steel companies which control the Cuban mines, little or none being sold to merchant furnaces.

Iron Ore Movement—Imports and exports of iron ore in the United States, seven months ended July 31, long tons:

	1910	1911	Changes	
Imports	1,508,076	1,002,713	D.	505,363
Exports	329,996	370,502	I.	40,506

Imports this year included 628,505 tons from Cuba; 138,175 from Spain; 136,021 from Sweden; 67,280 from Newfoundland and 21,220 from Canada.

Manganese Ore—Imports of manganese ore into the United States seven months ended July 31 were 131,434 tons in 1910, and 97,293 in 1911; decrease, 34,141 tons.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports the production of pig iron in the German Empire in July at 1,290,106 tons, being 27,109 tons more than in June. For the seven months ended July 31, the production was, in metric tons:

	1910	1911	Changes	
Foundry iron	1,639,125	1,776,561	I.	137,436
Forge iron	382,774	324,279	D.	58,495
Steel pig	770,555	1,005,797	I.	235,242
Bessemer pig	286,943	204,169	D.	82,774
Thomas(basic)pig	5,350,951	5,661,939	I.	310,988
Total	8,430,348	8,972,745	I.	542,397

Total increase this year, 6.4 per cent. Steel includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

METAL MARKETS

New York, Sept. 27—The markets remain for the most part rather dull, and prices for copper and other important metals are inclined to be rather weak.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold.			
Aug. 1911..	$ 480,799	$ 4,105,331	Imp. $ 3,624,532
" 1910..	3,150,423	12,818,606	Exp. 9,668,183
Year 1911..	15 910,449	40,473,010	Imp. 24,562,561
" 1910..	53,495,605	42,489,786	Exp. 11,005,819
Silver:			
Aug. 1911..	4,869,359	3,653,329	Exp. 1,216,030
" 1910..	4,755,708	4,119,362	Exp. 636,346
Year 1911..	44,587,570	29,534,724	Exp. 15,052,846
" 1910..	36,934,397	29,815,770	Exp. 7,118,627

Exports from the port of New York, week ended Sept. 23: Gold, $157,920, principally to Panama; silver, $656,981, chiefly to London. Imports: Gold, $598,109, nearly all from Mexico; silver, $79,869, largely from South America.

Gold—Prices on the open market in London were unchanged at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Most of the supplies went to the Bank of England.

Iridium—The price shows no further change, $65 per oz. being asked for pure metal.

Platinum—The market has been very firm, though not especially active. Prices have at last felt the effect of the recent advances abroad, and are this week a little higher. Dealers now ask $46@46.50 per oz. for refined platinum and $48.50@49 per oz. for hard metal.

Our Russian correspondent writes, under date of Sept. 14, that the market is very strong. The demand has considerably increased in comparison with last year, but the production of platinum is approximately the same. A slight increase of the prices is to be noted at Ekaterinburg for small lots, 9.95 rubles per zolotnik—$37.41 per oz.—being quoted for crude metal, 83 per cent. platinum. In St. Petersburg 37,700 rubles per pood—$36.95 per oz.—is quoted for the same grade.

SILVER AND STERLING EXCHANGE

Sept.	21	22	23	25	26	27
New York	52½	52½	52½	52½	52½	52⅝
London	24¼	24¼	24⅛	24¼	24¼	24⅛
Sterling Ex.	4.8640	4.8650	4.8645	4.8650	4.8655	4.8655

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The steadiness which has characterized the silver market for so long remains unbroken and the quotations the past week have stood unchanged at 24¼d. in London. Both China and India Bazaars have been buyers, and supplies have been readily absorbed. Market closes quiet and steady.

Gold and silver movement in Great Britain, eight months ended Aug. 31:

	Imports	Exports	Excess
Gold.....	£33,009 211	£20,447,686	Imp. £12,561,525
Gold, 1910..	40,362,069	30,181,655	Imp. 10,180,384
Silver.....	9,816,534	10,745,383	Exp. 928,849
Silver, 1910.	9,722,460	8,834,392	Imp. 888,068

Of the silver imported this year a total of £8,291,441 is credited to the United States.

Copper, Tin, Lead and Zinc

NEW YORK

Sept.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
21	12¾ @12⅞	12.10 @12.15	38⅛	4.45 @4.50	4.32½ @4.37½	5.85 @5.87½	5.70 @5.72½
22	12¾ @12⅞	12.10 @12.15	37⅝	4.45 @4.50	4.32½ @4.37½	5.85 @5.87½	5.70 @5.72½
23	12¾ @12⅞	12.05 @12.10	37⅝	4.45 @4.50	4.32½ @4.37½	5.85 @5.87½	5.70 @5.72½
25	12¾ @12⅞	12 05 @12.10	37⅝	4 45 @4.50	4.32½ @4.37½	5.85 @5.87½	5.70 @5.72½
26	12¾ @12⅞	12.05 @12.10	38	4.45 @4.50	4.32½ @4.37½	5.85 @5.87½	5.70 @5.72½
27	12¾ @12⅞	12.05 @12.10	38⅛	4.45 @4.50	4.32½ @4.37½	5.85 @5.87½	5.70 @5.72½

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
21	54½	55¼	58½	173⅜	171⅜	15¼	27⅜
22	54 5/16	55 1/16	58¼	171¼	169¼	15 3/16	27⅜
23	.....	.....	.....	.....	.....	.....	.....
25	54⅜	55 3/16	58¼	171	169¾	15 3/16	27¾
26	54 1/16	55¼	58¼	172¾	171½	15⅜	27¾
27	54⅞	55 11/16	58½	176	173	15	27¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.40c. ± £1 = ± 0.21¾c.

Copper—The market has again been affected by the course of the Stock Exchange. Some business has been done, and though one important seller is holding for higher prices, buyers have found plenty of copper at about 12¼c., delivered, 30 days. On the whole, however, business during this week was on a much reduced scale, as buyers are inclined to await developments in view of the great upheaval in the financial markets. There have been reports of forced sales in various quarters, but on the whole, the market has held rather well in the face of the many depressing factors, the close being steady at 12⅜@12½c. for Lake copper, and 12.05@12.10c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 11⅞@12 cents.

The standard market was under great pressure up to Wednesday, Sept. 27, but in sympathy with the rally in the stock market a heavy bear covering caused an advance at the close to £54 17s. 6d. for spot, and £55 13s. 9d. for three months.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill.

Exports of copper from New York for the week were 5625 long tons. Our special correspondent reports the exports from Baltimore at 2294 tons.

Tin—The market for this metal suffered in sympathy with the demoralization on the Stock Exchange. Transactions on the London Metal Exchange took on large proportions at the expense of values. The low point was reached on Sept. 25 at £169 15s. for spot and £169 for three months. Since then the metal has had a vigorous advance, but closes somewhat lower than the high point and unsettled at £176 for spot, and £173 for three months.

Advantage of the lower level reached was taken by dealers and consumers in the domestic market, where a good business is reported. At the close, September tin can be bought at about 38⅝ cents.

Lead—The market is unchanged at 4.45@4.50c., New York, and 4.32½@4.37½c., St. Louis.

The tension in the London market has relaxed somewhat and the close is easier at £15 for Spanish lead, and £15 2s. 6d. for English.

Spelter—The market has been very quiet throughout the week, and quotations at the close are more or less nominal at 5.70@5.72½c., St. Louis, and 5.85@5.87½c., New York.

The London market is somewhat weaker, the close being cabled at £27 15s. for good ordinaries, and £28 for specials.

The current quotation for zinc dust is 7½@7¾c. per lb., New York.

Base price of zinc sheets is $8 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Sales are a little better, but prices are low, foreign metal being pressed for sale. We quote 19@19½c. per lb. for No. 1 ingots, New York. Abroad the market is demoralized, owing chiefly to the action of the French producers, who are offering the metal at low prices.

Antimony—Business continues of small volume, buyers taking metal only for their immediate needs. Since the formal dissolution of the syndicate there is active competition for the small orders going. Cookson's is held at 8.25@8.37½c. per lb., but Hallett's has gone off to 7.60@7.90c.; while sales have been made as low as 7@7.15c. per lb. for Hungarian, Chinese and other outside brands.

Quicksilver—Business is more active, but prices are unchanged. The New York quotation is $46.50 per flask of 75 lb., with the usual advances for small lots. San Francisco, $46 for domestic orders and $43.50 for export. The London price is £8 12s. 6d. per flask, with £8 10s. quoted from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The last quotation was 700@725 marks per 100 kg.—75.5@78.3c. per lb.—at works in Germany, according to quantity.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 23—The base price paid this week for 60 per cent. zinc ore was $44@44.50. The base price paid for 80 per cent. lead ore was $56@57 per ton.

SHIPMENTS, WEEK ENDED SEPT. 23

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	606,250	.....	.....
Galena.....	574,500	300,000	....
Platteville.....	438,000	.....	438,880
Benton.....	415,500	76,580	.....
Highland.....	318,900	.....	.....
Hazel Green.....	160,000	.....	.....
Monfort.....	82,000	.....	.....
Linden.....	66,840	.....	120,000
Harker.....	54,690	116,890	.....
Total.....	2,716,680	493,470	558,880
Year to date.....	111,486,409	6,737,355	23,105,82

Shipped during week to separating plants, 2,906,860 lb. zinc ore.

Joplin, Mo., Sept. 23—The high price paid for zinc sulphide ore was $48, the base price of 60 per cent. zinc ranging from $40 to $45 per ton. Zinc silicate sold on a base for 40 per cent. zinc at $23@25 per ton. The average price, all grades of zinc, was $41.58. Lead sold for $58@60, the larger portion of the shipment being at the higher figure. The average price, all grades of lead, was $59.98 per ton.

A large portion of this week's shipment comprises ore purchased last week for future delivery. Buying this week, in the zinc ore market, was less active, and price offerings continued to decline throughout the week, with bids as low as

$38 per ton of 60 per cent. zinc at the week-end.

SHIPMENTS, WEEK ENDED SEPT. 23

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,724,250	.....	802,980	$104,160
Joplin	2,248,860	.....	228,090	56,315
Oronogo	695,170	.....	134,450	18,925
Duenweg	753,590	63,410	36,840	18,093
Galena	331,010	.....	175,320	12,375
Alba-Neck	442,150	.....	26 960	11,132
Miami	487,710	.....	37,250	8,430
Granby	19,880	527,490	24,980	8,130
Spurgeon	86,820	174,590	50,700	5,875
Lawton	151,040	.....	.....	3,473
Quapaw	138,930	.....	4,830	3,060
Cave Springs	128,310	.....	.....	2,950
Jackson	133.240	.....	.....	2,930
Aurora	56,640	63,360	.....	2,134
Carl Junction	85,610	.....	.....	2,055
Sarcoxie	62,430	.....	.....	1,310
Wentworth	62,340	.....	.....	1,308
Badger	53,790	.....	.....	1,183
Totals	9,661,770	828,850	1,522,400	$263,838

38 weeks .. 363,242,770 26,365,220 64,883,920 $9,505,184
Blende val., the week, $206,908; 38 weeks, $7,238,710
Calamine, the week, 11,273; 38 weeks, 416,458
Lead value, the week, 45,657; 38 weeks, $1,850,016

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	53.64	54.46
March	43.60	39.85	39.71	38.45	51.26	54.57
April	41.00	38.88	39.33	37.47	49.72	56.37
May	40.19	38.25	37.51	36.79	48.16	55.21
June	40.20	40.50	37.83	38.18	48.80	56.49
July	39.63	40.75	36.80	38.36	48.59	58.81
August	40.13	42.50	37.32	41.28	49.75	60.74
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43 20	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, Sept. 27—The general markets show little change, but there is some inclination to greater activity.

Copper Sulphate—Business remains steady, with a fair demand. Prices are unchanged at $4.50 per 100 lb. for carload lots, and $4.75 per 100 lb. for smaller parcels.

Arsenic—Demand continues good, and supplies are a little better, though still not excessive. Prices are unchanged at $2 per 100 lb. for spot lots of white arsenic and $1.87½ per 100 lb. for futures.

Nitrate of Soda—Business in this article is good, and prices a shade better. Quotations are 2.22½c. per lb. for spot lots, and for futures up to March, and 2.20c. per lb. for deliveries beyond March 1 next.

The production of nitrate in Chile for the year ended June 30, 1911, is reported at 54,197,531 quintals, or 2,526,521 long tons; an increase of 2.3 per cent. over the previous year.

MINING STOCKS

New York, Sept. 27—The week has been one of excitement and large trading, due chiefly to the quick and heavy fall in United States Steel issues. This was the result of widely circulated rumors that the Government had decided to begin suit for the dissolution of the Steel Corporation, claiming that its organization was in contravention of the Sherman law. Another version was that the corporation had voluntarily offered to dissolve, on terms to be arranged with the law officers of the Government. No definite statements could be obtained from either party, but the effect was startling. A week of continuous decline carried Steel common down as low as 51@52, and the preferred to 103½, with large sales, and apparently a tendency to further losses. Late yesterday a statement denying the rumors was issued.

The publication of this statement was followed today by a sharp upward reaction and an excited market.

This decline affected all the leading industrial stocks, and to some extent railroad stocks also. Amalgamated Copper dropped to 44¾, with a small recovery. The general downward tendency was helped by the weakness of the foreign markets, which have been disturbed by political complications and by the labor unrest. Heavy selling orders from London helped the declines here. The market closes confused.

The Curb market was affected by the commotion on the Exchange. Business increased, but prices were generally weak, and many declines were recorded. The copper shares declined, some only a fraction, others one or more points. Heaviest transactions were in Braden and Giroux, but Chino and Inspiration also came in for a share of the business. Ohio Copper was off, with more sales than have been reported for some time. Cobalt stocks were also weak, but in less degree. Kerr Lake and Nipissing held their quotations well, as did the Porcupine stocks.

There was one sale of Homestake, 120 shares, at $82.50 per share.

Boston, Sept. 26—Low prices of the year were made in copper shares Sept. 25, when the Wall Street market was in a semi-panicky condition. Following the break in Amalgamated to $44.50, which represents a break of $13 during the week, the local list weakened in sympathy; but there was no volume of offerings and prices slid off more from the lack of demand than any other reason. Allouez touched $22, a gross decline of $2.75, Calumet & Arizona $45, a loss of $4.50, with other breaks all along the line.

The safety in the local situation is that many stocks are selling at around $10 per share, which does not permit their being carried on a margin, and consequently they sold outright. Many of the higher-priced stocks have declined so much that they are margined down pretty well or have been taken up. Copper shares are not good collateral at the present time, and for this reason brokerage houses are not insisting on their purchase to any great extent.

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company	June	July	August
Alaska shipments	1,773,300	.....	.....
Anaconda	21,850,000	21,900,000	22,500,000
Arizona, Ltd	2,700,000	2,750,000	2,720,000
Balaklala	.....	.....	.....
Copper Queen	7,088,862	6,373,062	7,006,097
Calumet & Ariz	3,656,000	4,394,000	4,650,000
Detroit	1,732,692	1,590,357	2,080,100
East Butte	841,200	.....	854,000
Mammoth	.....	1,598,082	.....
Nevada Con	5,307,400	5,258,582	5,249,515
Old Dominion	1,907,000	2,114,000	1,982,000
Shannon	1,098,000	1,150,000	1,442,560
South Utah	158,661	254,462	269,546
United Verde*	3,000,000	3,000,000	2,500,000
Utah Copper Co	7,908,685	7,555,407	9,010,669
Lake Superior*	19,800,000	17,060,000	19,000,000
Non-rep. mines*	12,851,700	16,800,000	.....
Total production	91,673,500	.....	.....
Imports, bars, etc.	22,348,964	20,999,078	.....
Total blister	114,022,464	.....	.....
Imp. in ore & matte	4,744,912	4,205,940	.....
Total	119,767,376	.....	.....
Brit. Col. Cos.:			
British Col. Copper	816,676	854,122	.....
Granby	858,733	1,228,846	.....
Mexican Cos.:			
Boleo	2,315,040	1,973,680	2,149028,
Cananea	3,462,000	3,994,000	.....
Moctezuma	2,071,960	2,340,404	2,263,707
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Spassky, Russia	542,080	672,000	.....
Exports from:			
Chile	3,960,000	7,168,000	4,032,000
Australia	7,168,000	7,056,000	7,392,000

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export
VIII, 1910	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,936,364	69,855,660

VISIBLE STOCKS.

	United States.	Europe.	Total.
IX, 1910	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

Calumet & Hecla does not get very far away from its low price of $360 per share. Ahmeek has fallen $7 on the Curb to $148. The Curb market has been dull and prices have been heavy for the most part.

Assessments

Company	Delinq	Sale	Amt
Argenta, Ida	Sept. 10	Oct. 10	$0.001
Best & Belcher, Nev	Sept. 4	Sept. 25	0.05
Black Horse, Ida	Sept. 18	Oct. 19	0.01
Buffalo, Ida	Sept. 5	Oct. 5	0.002½
Calumet, Ida	Aug. 15	Sept. 15	0.001
Challenge, Nev	Aug. 17	Sept. 7	0.05
Columbus Ext., Utah	Sept. 4	Sept. 27	0.05
Con. Imperial, Nev	Oct. 10	Oct. 31	0.01
Con. Virginia, Nev	Sept. 9	Sept. 13	0.25
Douglas, Ltd., Ida	Aug. 25	Sept. 26	0.002
Exchequer, Nev	Sept. 19	Oct. 10	0.05
Hale & Norcross, Nev	Aug. 30	Sept. 20	0.05
Montana-Bingham, Utah	Oct. 20	Nov. 10	0.01
Mountain Dell, Utah	Oct. 24	Nov. 14	0.01
New York-Bonanza, Utah	Sept. 8	.....	0.02
Overman, Nev	Sept. 12	Oct. 3	0.05
Pretoria, Ida	Aug. 15	Sept. 15	0.000½
Savage, Nev	Aug. 22	Sept. 12	0.10
Springfield, Ida	Sept. 2	Oct. 2	0.000½
Tintic Standard, Utah	Sept. 9	Oct. 9	0.00
Torino, Ida	Aug. 15	Sept. 15	0.00
Utah Ideal, Utah	Sept. 6	Oct. 8	0.001½
Utah United Utah	Oct. 19	Nov. 4	0.01
Verde May, Ida	Sept. 6	Sept. 21	0.000½
Victoria, Mich	Aug. 21	.....	1.00
Western Monitor, Utah	Sept. 11	Oct. 12	0.002½

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	52.630	23.519	25.034	24.286
August	51.125	52.912	52.171	23.588	24.428	24.082
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404	12.385	12.798	12.611	55.310	56.368
July	12.215	12.463	12.570	12.720	54.194	56.670
August	12.490	12.405	12.715	12.634	55.733	56.264
September	12.379	.....	12.668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1910.	1911.	Month	1910.	1911.
January	32.700	41.255	July	32.695	42.400
February	32.920	41.614	August	33.972	43.319
March	32.403	40.157	September	34.982	.....
April	32.976	42.185	October	36.190	.....
May	33.125	43.115	November	36.547	.....
June	32.769	44.606	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Mohth	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	4.499	4.291	4.397	12.531	13.530
August	4.400	4.500	4.290	4.406	12.513	14.026
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	5.695	5.002	5.545	22.406	25.006
August	5.279	5.953	5.129	5.803	22.800	26.801
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52	15.90	15.60	14.06	15.53	14.56
July	16.40	15.90	15.40	14.03	15.40	14.53
August	16.09	15.90	14.89	14.00	15.16	14.47
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15.84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 26

Name of Comp.	Bid.
Acacia	.02¾
Cripple Cr'k Con.	.02¾
C. K. & N.	.12
Doctor Jack Pot	.05¾
Elkton Con	.60
El Paso	.53¾
Findlay	.04
Gold Dollar	.14¾
Gold Sovereign	‡.02
Isabella	.08
Jack Pot	.06
Jennie Sample	.06
Lexington	‡.01
Moon Anchor	.01¼
Old Gold	.03¾
Mary McKinney	.45½
Pharmacist	‡.01½
Portland	.95
Vindicator	.73
Work	.01

SALT LAKE Sept. 26

Name of Comp.	Bid.
Beck Tunnel	.12
Black Jack	.09
Carisa	.16
Cedar Talisman	.03½
Colorado Mining	.31½
Columbus Con	.27
Daly Judge	‡4.12½
Grand Central	1.10
Iron Blossom	1.00
Little Bell	.35
Lower Mammoth	.01
Mason Valley	6.70
May Day	.11½
Nevada Hills	3.00
New York	‡.05¾
Prince Con	.64
Silver King Coal'n	2.17½
Sioux Con	.16½
Uncle Sam	.35½
Yankee	‡ 15½

TORONTO Sept. 26

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.00	Pearl Lake	.44
Hudson Bay	75.00	Porcu. Gold	.39½
Temiskaming	.34	Porcu. Tisdale	.05
Wettlaufer-Lor	.80	Preston E. D.	21
Apex	.14	West Dome	1.00
Central	2.62½	Standard	.04
Dobie	‡1.35	Foley O'Brien	.75
Dome Exten	.64½	Rea	3.00
Hollinger	11.60	Coronation	.04½
Imperial	.11	Swastika	.34½

SAN FRANCISCO Sept. 26

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.02	Belmont	6.80
Belcher	.40	Jim Butler	.23
Best & Belcher	.16	MacNamara	.19
Caledonia	.34	Midway	.26
Challenge Con	.14	Mont.-Tonopah	.77
Chollar	.12	North Star	.19
Confidence	.54	West End Con	.57
Con. Virginia	.75	Atlanta	.16
Crown Point	.50	Booth	.08
Gould & Curry	.05	C.O.D. Con	.07
Hale & Norcross	.18	Comb. Frac	.08
Mexican	3.27½	Jumbo Extension	.25
Occidental	.50	Oro	.04
Ophir	1.67½	Silver Pick	.09
Overman	.35	St. Ives	.35
Potosi	.17	Tramps Con	.02
Savage	.21	Argonaut	2.25
Sierra Nevada	.33	Bunker Hill	6.50
Union Con	1.05	Cent. Eureka	1.00
Yellow Jacket	.24	So. Eureka	‡6.00

N. Y. EXCH. Sept. 26

Name of Comp.	Clg.
Amalgamated	47⅝
Am. Agri. Chem	.45
Am.Sm.&Ref.,com	60¼
Am. Sm.& Ref., pf.	100
Anaconda	31½
Batopilas Min	1¼
BethlehemSteelpf	54
Chino	16⅞
Comstock Tunnel	.17
Federal M.& S., pf.	49
Goldfield Con	5⅜
Great Nor., ore ctf.	45
Homestake	82¼
Miami Copper	16⅞
Nat'nalLead,com.	44⅛
National Lead, pf.	105
Nev. Consol	16
Pittsburg Coal, pf.	79½
Ray Con	12⅛
RepublicI&S,com	21⅞
Republic I & S, pf.	84
SlossSheffi'd,com.	34¼
Sloss Sheffield, pf.	110¼
Tennessee Copper	32
Utah Copper	40
U. S. Steel, com	56⅜
U. S. Steel, pf	107¼
Va. Car. Chem	44⅞

N. Y. CURB Sept. 26

Name of Comp.	Clg.
Barnes King	‡.15
Braden Copper	4⅛
B. C. Copper	3½
Buffalo Mines	1.40
Butte & Vipond	.52
Butte Coalition	14
Cobalt Central	.00½
Con. Ariz Sm.	¾
Davis-Daly	1/16
Ely Con	5/16
Florence	1¼
Giroux	3⅛
Greene Cananea	5⅞
Greenwater	06
Guanajuato	‡33¾
Guerrero	1¼
Guggen. Exp	160
Inspiration	5¾
Internat. S. & R.	‡124
Kerr Lake	3⅛
La Rose	4⅛
McKinley-Dar-Sa.	1⅝
Min. Co. of A. new	4½
Moneta Porc	.12
Nev. Utah M. & S.	⅝
New Baltic	3¾
Nipissing Mines	8
Ohio Copper	1⅜
Pacific Sm. & M.	¼
Precious Metals	‡1¾
Ray Central	1⅜
Red Warrior	‡1½
South Utah M.& S.	⅜
Standard Oil (Old)	625
Stand'd Oil of N.J.	340
Stand'd Oil Subs.	325
Stewart	.82
Tonopah	6⅛
Tonopah Ex	11/16
Tri-Bullion	5/16
Tularosa	⅞
Union Mines	7/16
Yukon Gold	3½

LONDON Sept. 27

Name of Com.	Clg.
Camp Bird	£1 8s 3d
Dolores	1 10 0
El Oro	1 3 0
Esperanza	1 14 0
Mexico Mines	6 16 3
Oroville	0 5 7½
Stratton'sInd.	0 2 0
Tomboy	0 17 9

BOSTON EXCH. Sept. 26

Name of Comp.	Clg.
Adventure	4¼
Algomah	3
Allouez	24
Am. Zinc	21¾
Arcadian	2
Arizona Com	.70
Atlantic	‡6
Bonanza	.50
Boston & Corbin	4¾
Butte & Balak	3½
Calumet & Ariz	47¼
Calumet & Hecla	370
Centennial	8¼
Con. Mercur	.04
Copper Range	48½
Daly-West	5¼
East Butte	9⅝
Franklin	6⅞
Granby	28
Hancock	17½
Hedley Gold	14
Helvetia	.85
Indiana	6¾
Isle Royale	12
Keweenaw	2
Lake	24½
La Salle	3½
Mass	5
Michigan	1¼
Mohawk	37½
New Arcadian	2
North Butte	21⅝
North Lake	4⅛
Ojibway	4½
Old Dominion	37
Osceola	82
Parrot	8
Quincy	59
Shannon	7½
Shattuck-Ariz	14⅛
Superior	23
Superior & Bost.	2½
Tamarack	21
Trinity	3
Tuolumne	3 7/16
U. S. Smelting	32
U. S. Smelt'g, pf.	46½
Utah Apex	2
Utah Con	12
Victoria	1⅞
Winona	5
Wolverine	88
Wyandot	95

BOSTON CURB Sept. 26

Name of Comp.	Last
Ahmeek	145
Bingham Mines	.50
Boston Ely	.99
Boswyocolo	.11
Cactus	.09
Calaveras	1
United Verde Ext.	.31
Chief Cons	.70
Corbin	1
Cortez	1⅛
Crown Reserve	21⅝
First Nat. Cop.	1
Live Oak	18½
Majestic	31
Mazatan	‡ 90
Nat'l Mine & Ex.	.11
Nevada-Douglas	2¼
Oneco	1½
Raven Copper	26
Rhode Island Coal	1½
San Antonio	3½
South Lake	3⅞
Trethewey	65
United Zinc, pfd.	‡2
Vulture	4⅞
Yuma	‡.02

‡Last quotation.